

RAILROAD GAZETTE

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TWENTIETH YEAR.

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POSTAGE FREE.

NEW YORK: 73 Broadway.

FRIDAY, FEBRUARY 16, 1877.

CHICAGO: 77 Jackson St.

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Bethlehem Steel Rails,
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the most incredulous that it is the best. The best
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Ohio R. R. The train weighed 250 tons and con-
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time in stopping, 14 seconds; distance run, 587.8-12
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to apply and relieve the brakes, and accomplishes
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*[This index to the advertisements in the RAIL-
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may be more convenient and valuable to those
who make use of them as a directory of railroad
supplies and equipment. A number of adver-
tisements appear only "every other week" or
"once a month," in such cases, where the adver-
tisement is not in the current number, a blank
appears instead of the foto opposite the name.]*

Accountants: Calhoun & Steele, 20 Nassau street, N. Y.

Air Brakes: Wm. Loughridge, Baltimore.
Westinghouse Air-Brake Co., Pittsburgh.

Axes: A. P. Roberts & Co., Philadelphia.
Wilson Walker & Co., Pittsburgh.

Boiler Punches: I. P. Richards, Providence, R. I.

Bolts, Nuts, Boiler Rivets, etc.: Morris & Townsend, Philadelphia.

Bridge Bolts: American Bridge Co., Chicago.

Baltimore Bridge Co., Baltimore.

Cincinnatti Bridge Co., Cincinnati.

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"MINERVA" SWEDES SPRING STEEL,

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Rubber Steps: Rubber-Step Manufacturing Co., Boston.

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Shafting: Wm. Sellers & Co., Phila. & 79 Liberty st., N. Y.

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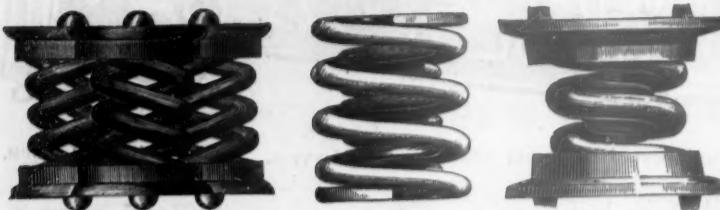
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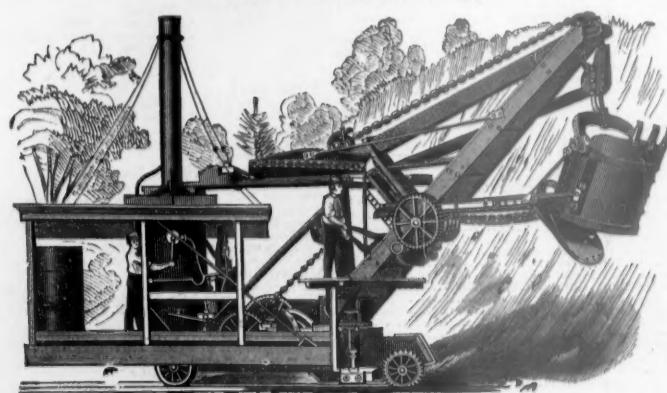
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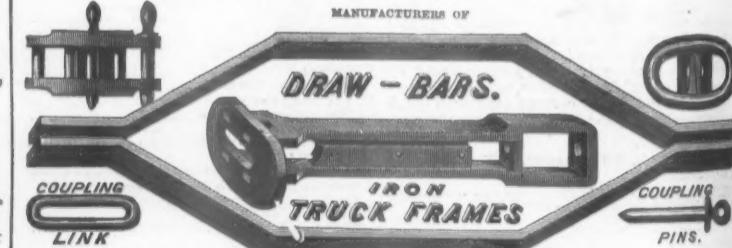
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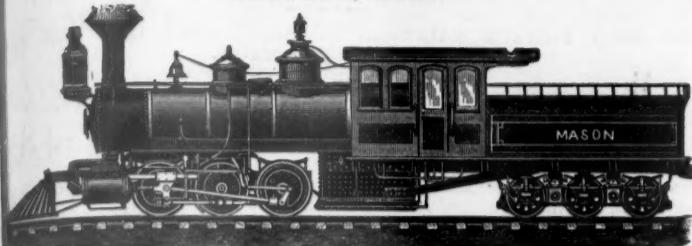
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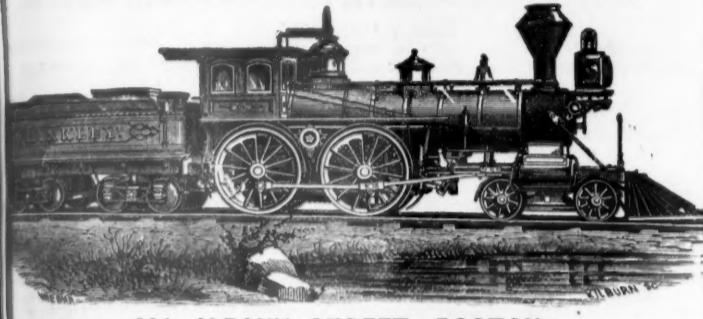
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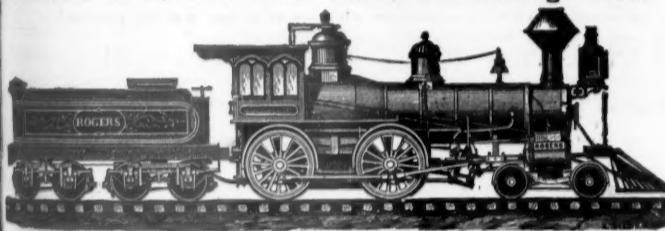
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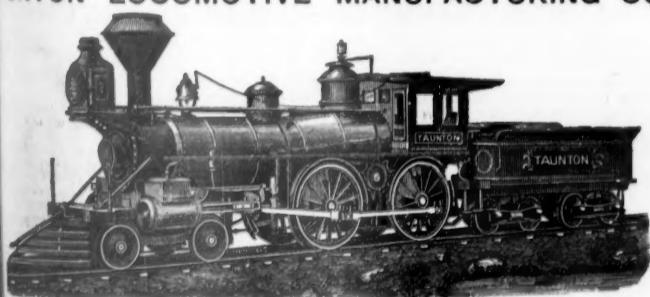
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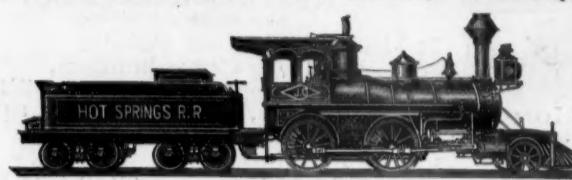
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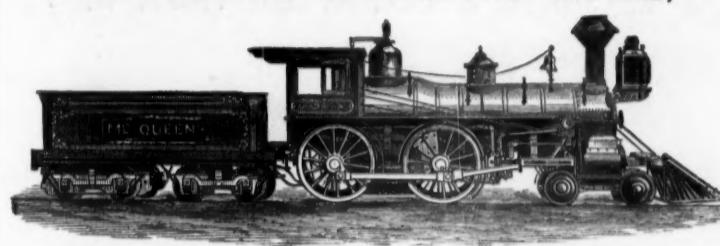
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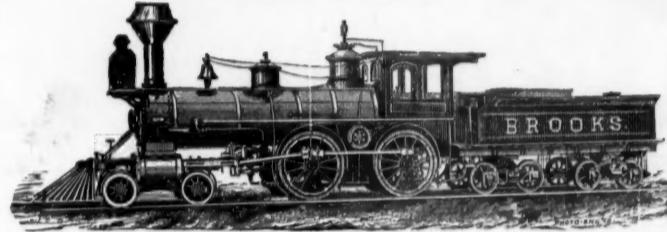
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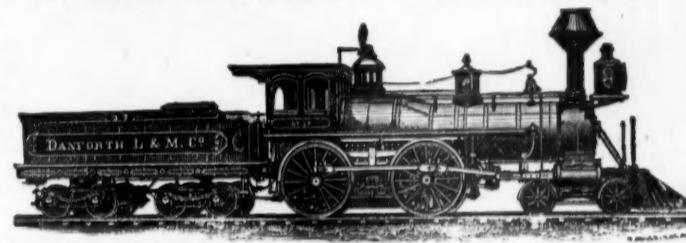
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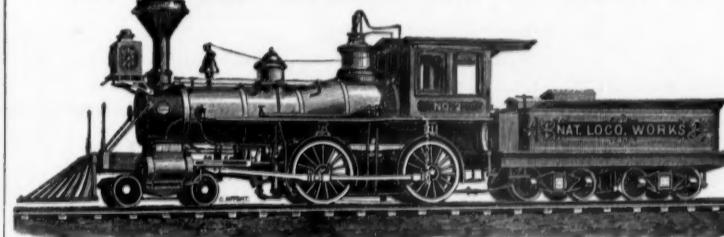
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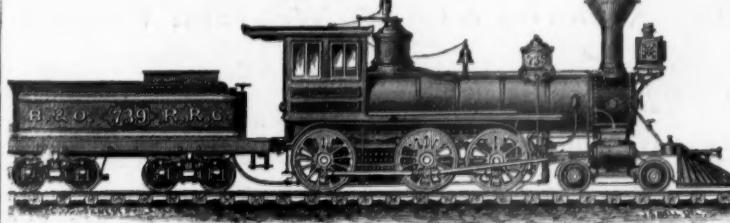
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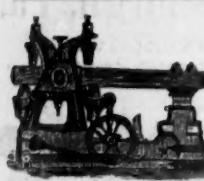


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All Material and Workmanship Guaranteed to be of the Very Best.

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Has won golden opinions from the Mechanical World during the four years it has been before the public, and has reached a sale of 190 Hammers, all in successful operation, in this and foreign countries.

It Has More Good Points,
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Manufacturers of STREET CARS (Exclusively),
Embracing every variety of Close and Open Cars for either one or two horses.

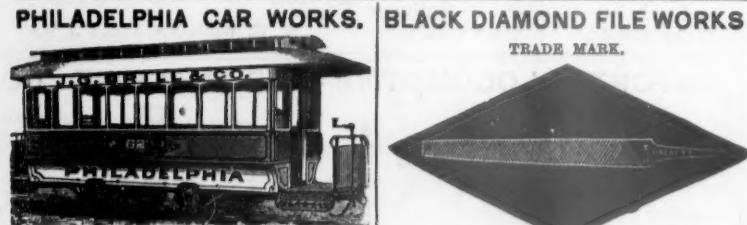


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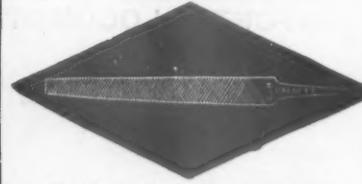
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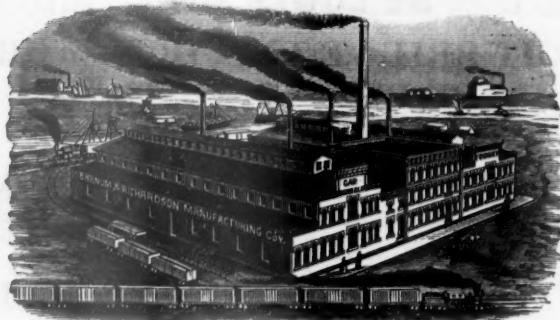
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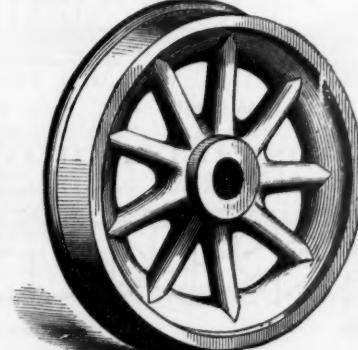
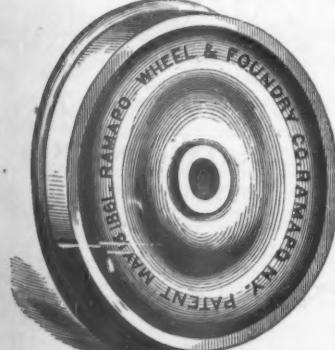
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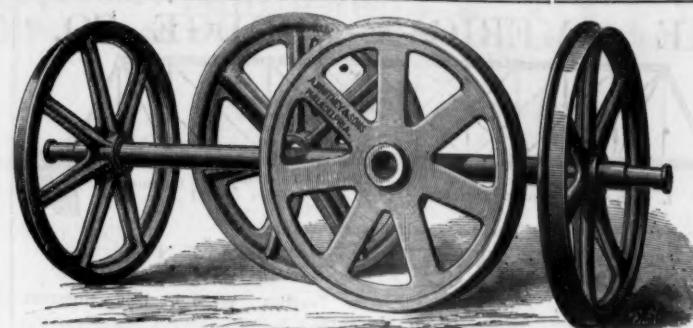
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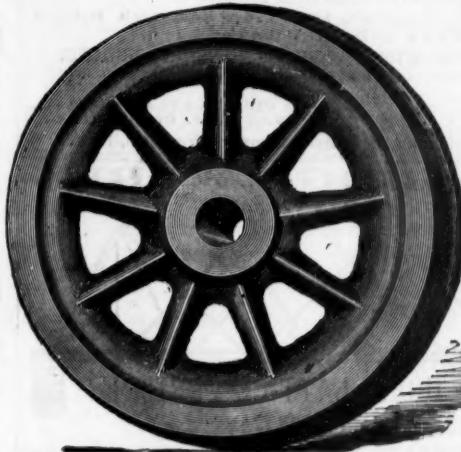
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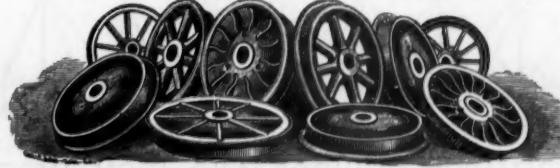
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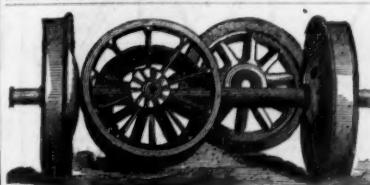
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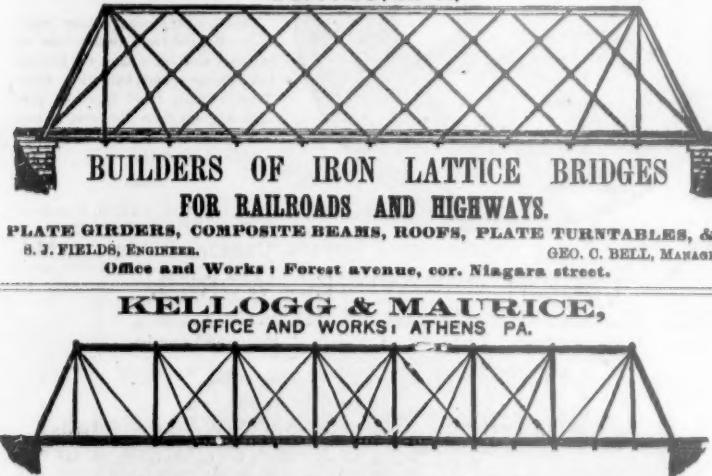
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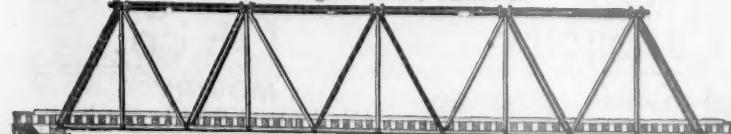
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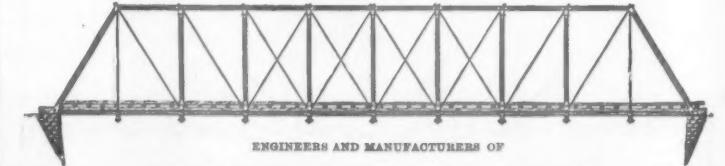
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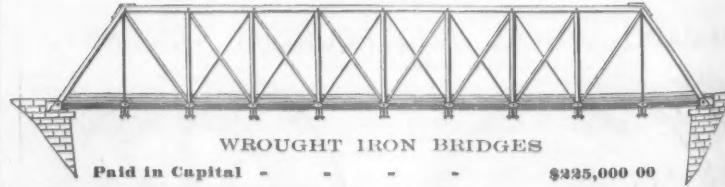
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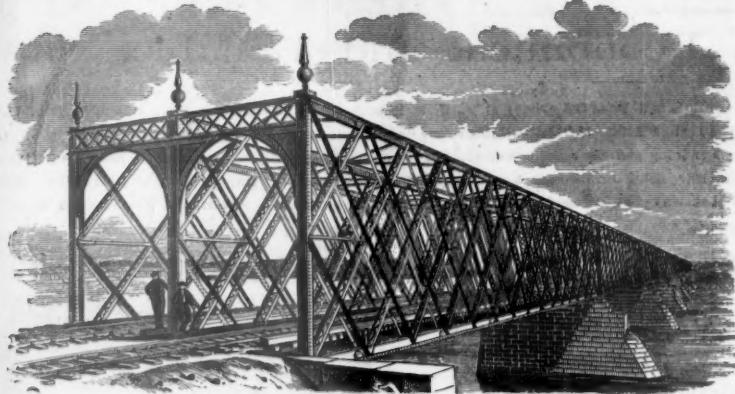
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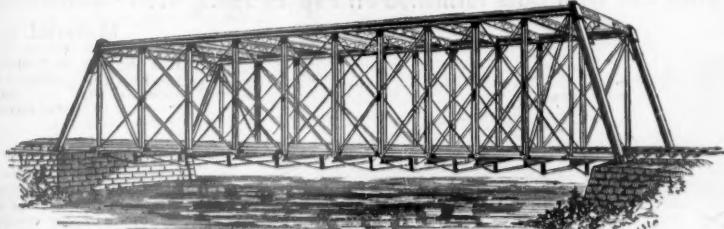
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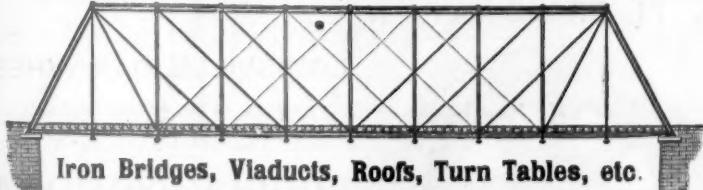
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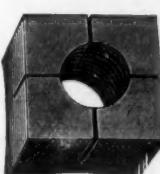
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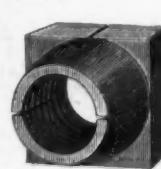
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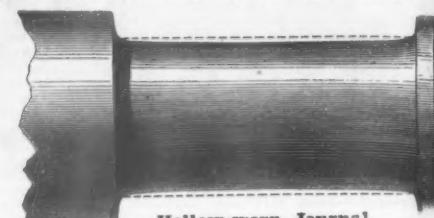
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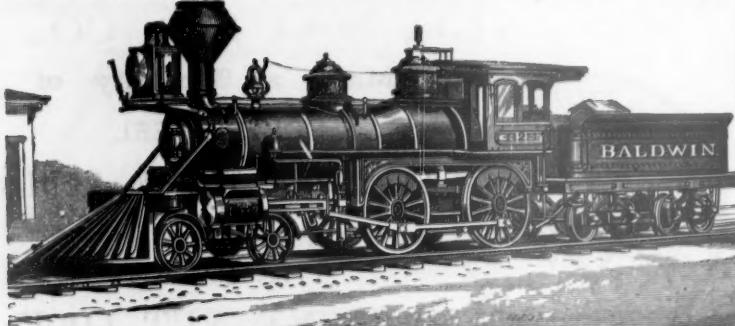
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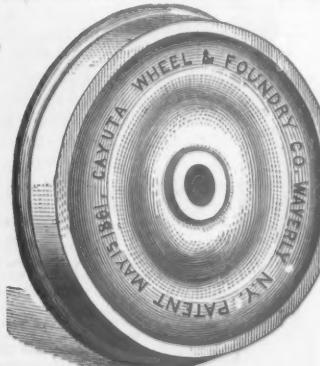
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JAS. L. FORD, office Railroad Gazette.



FRIDAY, FEBRUARY 16, 1877.

Screw-Cutting Lathe.

We are indebted to *Engineering* for the above engravings and the following description:

We illustrate, above, a novel arrangement of screw-cutting and turning lathe constructed by Messrs. Ferris & Miles, of Philadelphia, and sent by them to the Centennial International Exhibition. The lathe has been designed to afford a quick and convenient method of cutting screws of different pitches, and of changing from turning to screw-cutting or vice versa.

Referring to our engravings it will be seen that the cone spindle *a* extends beyond the end of the lathe, and carries upon it two sliding pinions, *b*, *b*, of different diameters, upon whose base plays a double-slotted swing arm, *c*. This arm may carry by means of the straight slot *d* one or more intermediate wheels, which gear with either of the sliding pinions, *b*, *b*, and can be swung into gear with any wheel of the cone of gears *f* on the lead screw of the lathe. Also by means of the curved part with its slot, *e*, the swing arm may be fastened by its split clamp, *g*, and pinch bolt *h*, at any point of the index stud *i*.

The wheels of the cone *f* are so calculated with reference to the sliding pinions upon the spindle that sixteen or more different screw threads of the United States standard may be cut by them (of course any other standard could be used), say,

5/8 in. bolt in each end of the fish or splice plate. Hence all lateral strains passing to the west abutment must pass through this weak point, having an ultimate resistance of only three or four tons, even if tightly fitted, which was not the case.

3. I stated that the main braces had a sectional area of 6 to 9 square inches. I find some of them were as heavy as 10 square inches, generally varying from 8 to 10 in., but the man who put them in the bridge says that he "took them from the pile indiscriminately, and they were not marked," so there is no certainty of their being put in with any regard to their differing stiffness, except that some of the paint marks on the angle blocks show a general increase of weight of braces toward the center of the bridge! I also find that the stay bolts, holding the main braces in end panels, and running through gas-pipes for struts, were tapped into the angle block at bottom. They were 1 1/4 in. in diameter, five in each end panel.

4. I stated that the shims at ends of top-chord bars were held in place only by friction; but I find they were bent up at sides to hold them in place.

5. I stated that no broken I-beams were found; but I find there were a few broken, but mostly bent and twisted, showing no fault in quality of material.

6. I stated that the north truss rods all went to the north, but find a few at the east end leaned to the south. This may have some connection with the fact that the last car went north.

In addition to what I stated before about the chipping off of corners of main braces, I find some of them had been chipped

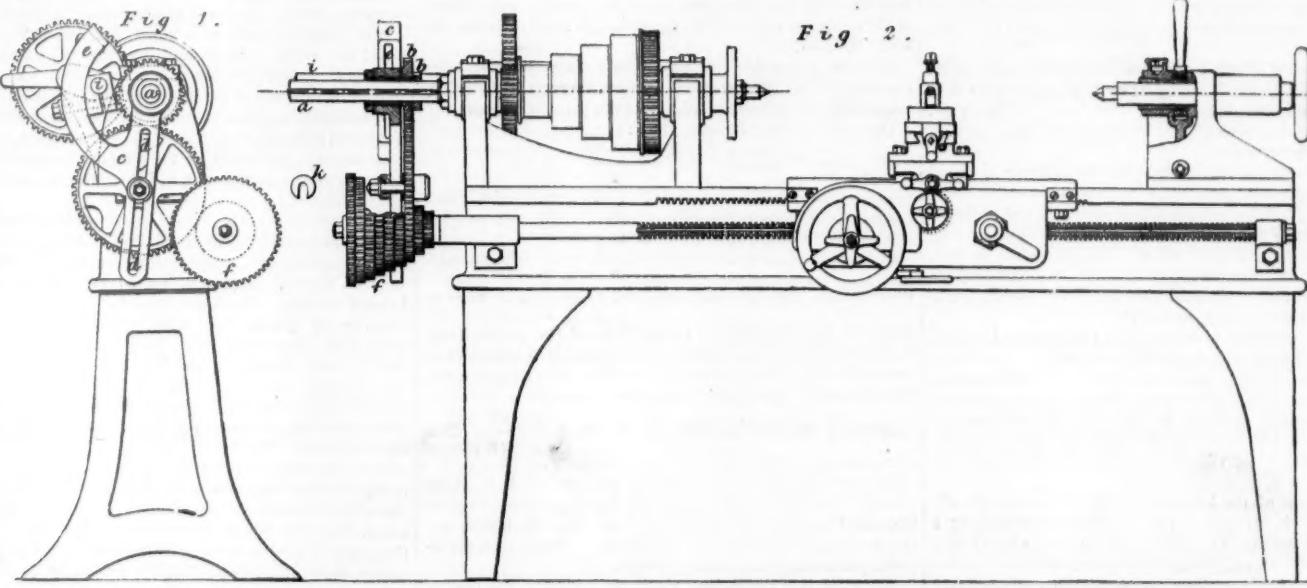
thorough inspection by competent men is the only means of safety.

The question is whether inspection shall be in the hands of men appointed by political influence, possibly good in one State and probably bad in the next; working upon an arbitrary and conflicting system, varying in each State according to the ideas of each inspector, or by a Board of Government Engineers, men of large views and liberal education.

This board, as I said, should meet and lay down in the beginning a system of general rules to govern all its individual members. These rules should be established upon evidence taken from the bridge experts of this country, upon all mooted points. For example, Mr. C. Herschel should appear before them and maintain that no pin-connected bridges are safe, and nothing but riveted work ought to be allowed.

Mr. F. H. Smith, on the other hand, would defend his views with that ability which he has often showed before, and the point would be decided judicially. Once decided, the rule would be laid down, and nobody would ask to deviate from it. There are many other similar points, such as will occur to your readers, that it is for the interest of the public should be settled. Once settled and the rules laid down, each Government engineer would appoint his civil assistants. Cannot they be trusted to do this? I believe they can.

This system would give safety not only to the public, but to respectable bridge constructors, whose reputation is soiled by such disasters as those of *Ashtabula*, with which they are entirely unconnected.



SCREW-CUTTING LATHE, CONSTRUCTED BY MESSRS. FERRIS & MILES, PHILADELPHIA.

from 1 or 2 per inch pitch up to 14 per inch. These figures are laid off and stamped as an index upon the index stud *i*.

Practically, therefore, the operator has only to set the split clamp *g* by its pinch bolt *h* at any desired figure of the index. The intermediate wheel will then gear with the proper wheel upon the lead screw to cut the pitch indicated by the index figure.

Of the two lines of figures of the index, the one marked "in spur" is derived from the larger sliding pinion *b*, the other line marked "in pinion" from the smaller. The change from one to the other is made instantly by slightly slackening the screw stud which clamps the intermediate wheel in the straight slot *d* of the swing arm *c*, and changing the split washer *k* from the inside of the arm to the outside, or vice versa, the intermediate wheel being moved just one gear face, as the split washer *g* is of just that thickness.

The thread upon the lead screw is reserved for screw-cutting only, but by means of a keyway traversing its whole length, the screw is also made to serve as a driving shaft for a train of gears in the carriage from which is derived the cross-feed motion, and also, by means of the rack upon the bed, the longitudinal traverses for turning and surfacing. These are applied and released by single motions of convenient handles. It is to be observed that the index gives sixteen or more changes of traverse by the rack gearing for turning and surfacing and cross traversing, in addition to the sixteen or more changes by the lead screw for screw cutting. Therefore, by the quick and easy method of changing we have described, the operator has at his instant command a variation of thirty-two or more traverses, comprising all the screw threads in general use. The arrangement is neat and compact and tends to enhance rather than disfigure the general appearance of the machine.

The sliding head spindle is fitted with a split conical bushing. This can be drawn into a conical seat by a nut and handle (as seen in the drawing), when it is wished to clamp the spindle which, by this means, is centred and held truly in line.

Contributions.

More Details of the Ashtabula Bridge.

No. 12 WEST STREET, BOSTON, Feb. 9, 1877.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Having failed to get my corrections mailed in time last week, I now would add a few new facts about the Ashtabula bridge which have come to hand since I wrote you, viz.:

1. The bolts forming the yokes by which the main and counter braces were clamped in centre of each panel were one inch diameter instead of 5/8 in.

2. The top lateral bracing was adjusted by turnbuckles, but it did not extend to the abutment on the top chord, so that all lateral strains must pass down on the transverse brace rods and reach the abutment by the bottom lateral system. Now near the west end, at the very last panel, these bottom laterals were found on erection to be too short and were spliced, as was seen, by a fish-plate on one side, secured only by one

half off at one end, losing the whole of one head and half the web.

Not only was one floor beam in each panel secured to chords by stirrup and inside lugs to gauge the width apart of chords, but all floor beams were so arranged.

7. I stated that faces of angle blocks were not planed; but find that strips 2 in. wide were planed across them between the lugs which were intended to hold the braces, in place, but these strips were much narrower than the braces and the remainder of the bearing was chipped. Paint marks on angle blocks showed in one case that a brace had slipped 3 in. down at top toward the rod, while many had slipped less, and many sideways also, when last painted.

Fig. 3

As to the working plans and drawings, I find that they indicate the position of the main braces as first applied, viz., with the head flanges of the I-beams parallel to plane of truss. They also indicate the struts between lower chords to be applied at same places as diagonals of lateral system; but an inspection of the wreck showed this not to have been the case in the bridge. The statement I made as to the struts being alternate with the ties is confirmed by an old photograph of the bridge, seen at the Fiske House, Ashtabula, some weeks ago and afterward taken by the legislative committee.

EDWARD S. PHILBRICK.

Government Bridge Inspection.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Without taking up too much space, I would like to say a few more words in regard to Government inspection of bridges.

The system proposed by Mr. Adams would certainly be of use in the future, but it would not prevent you and I being killed by other bridges as unsafe as that at Ashtabula, which are still called safe, because not found out.

If the system proposed by me is hard upon bridge-builders, so much the worse for them. Safety the public will have; and

it would give protection also to railway managers, and it was in their interest that I proposed Government inspectors should report and command instead of report and recommend. A bridge once condemned by an authority from which there was no appeal, the directors would find the money to replace or strengthen it somehow or other. As it is now, either no one reports to them a dangerous bridge, or else there are conflicting reports; and they—"guess they will risk it another year." I was told the other day of an old wooden Howe bridge whose rods have been strained for the last 30 years, over 25,000 lbs. per square inch. When they break, some wiseacre will pick up the pieces, and say: "Here is evidence of the crystallization of iron under strain."

T. C. CLARKE.

Failure of a Riveted Bridge.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The advocates of riveted bridges have for some time been laying a great deal of stress upon, and loudly proclaiming the statement that there have been no failures of that class of construction. I would deprecate any attempts to claim superiority of one method over another, based upon failures of structures built upon any system. Every one knows that the most perfect system may be made worthless by an improper application, and that a vastly inferior system may be made to do great service by careful attention to details. Therefore, while not calling attention to any failure as an argument against the system, for I do not believe it to have taken place on account of any inherent qualities of the general system of riveted work, I would refer to the files of the *Railroad Gazette*, Jan. 2, 1875, which contains an account of the failure of two spans of 180 ft each, riveted bridges (accompanied by loss of life) built in England for the Pacasmayo Railroad in Peru. Each span weighed 127 tons. A span of the same length, ordered from the United States by telegraph, weighing 61 tons, was able to do the work with entire satisfaction.

E. H. HEWINS, C. E.

BOSTON, Feb. 10, 1877.

The Strength of Butt-Joint and Riveted Bridges Compared.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The disaster at Ashtabula in no way throws any blame on any of the numerous bridge works and bridge engineers of this country.

Its design was such as we do not build; it has never been used but once; and the bridge was the product of special orders of one single man, not the engineer, of the railroad company. Hence the only moral to be drawn would be: *ne rutor ultra*

crepidam, and that railroad companies as a general rule will do well not to design their bridges themselves but to give reasonable specifications and to apply to the regular bridge-builders, so as to receive a choice number both of competitive designs and of competitive prices.

This is the general usage in the United States, and it is a most excellent and very economical one, which has been fruitful and has produced the most approved general systems used all over the world. With the single exception of the plate girder and the rivet joint introduced by England, and a few commercially impracticable odd forms sometimes used in Germany, all general systems of truss bridges sprung from competitive design and competitive prices. And the links of suspension bridges, and wire suspension bridges and the pin joint and hundreds of ingenious details are American in invention and make part of what characterizes the American system of bridges.

Those who have read carefully the criticisms contained in the Boston newspaper article reprinted in the *Railroad Gazette* will have found that its writer was not led solely by his zeal for improvement in bridge design and for the safety of the public, but that there were still other at least equally strong motives governing his pen.

Messrs. F. H. Smith and A. P. Boller have ably disarmed the latter part of that article, while I now intend to analyze some of its objections to the current American bridge details; and it shall be my earnest endeavor to derive as much good as possible from the discussion of their merits.

The scientific books from which we study the theory of strains and proportions in bridges treat the subject in but one bearing: They only suppose quiet statical loads in all possible and most trying positions.

It is true that practical bridge engineers build those members which are influenced directly by rolling loads heavier than others; but books generally pay little attention to this view, and many of the costliest bridges in Europe are built without any reference to this practice.

If it is true that this view is sufficient for arriving at sound principles in bridge construction, compressional members need only be designed to be compressional members, and members that have only to stand tension need no provision for compression. All compressional and all tensional joints, in fact, are butt joints, whether riveted or not. In the riveted joint the butting surface is divided into numerous small, nearly semi-circular, rivet-bearing surfaces.

In the joint particularly termed butt joint, of good design, two machine-finished compressional members, constituting units, have their bearing surfaces planed so as to be perpendicular to their longitudinal axis. These surfaces, bearing against each other, transfer the pressure as uniformly as possible, they are properly secured against motion in any direction, as caused by vibrations, oscillations and moderate impacts.

The butt joints of the Ashtabula bridge were not planed, or only planed in parts and partly; the bars composing a compressional member were not made to form a unit; they were not at all, or only very improperly, secured against movement as caused by vibrations, oscillations or moderate impacts.

By far the majority of American bridges are formed with butt joints; the most experienced and best bridge engineers in the country use them, as the Keystone, the Phoenixville, the American, the Louisville, the Baltimore and other firms; and it is not far out of the way to say that there are in this country probably as many miles of bridges with butt joints as there are riveted bridges in all Europe together.

Among these there are butt-jointed bridges with and without cast-iron butting blocks, we may say perhaps equal percentages of each sort.

It is true, and I am the last man to advocate it, there are in existence badly arranged joints of this sort; but we may also meet with rivet-jointed top chords that are insufficient, because the designer had only in view the forces as acting according to his books.

To one particular form of butt joints as regards the end top boxes and the end foot boxes of bridges, I would refer here. Castings are made in semi-box shape, but have no tenons, in order that the bearing surfaces may be planed with the rotary cutting tool. Little chips of angle iron are riveted or bolted to the bearing surfaces with a few rivets or bolts, so as to form tenons, the strength of which is very small indeed.

The question now is, may there happen instances when the well-made butt-joint is no longer sufficient, so that there may be tension in top chords or posts, and pressure in bottom chords or diagonal ties? Such reversion of strains cannot occur in deck-bridges with satisfactory floors. We then have only to examine through bridge and half-deck bridges. Nor can reversion of strains happen under mere loads imposed by trains on the rails.

Only in one instance momentary reversion of strains might occur, that is when locomotive trains run into trusses.

We will, therefore, first examine what is the amount of force accumulated, that by impact may affect the stability of a bridge.

Take a passenger train of 450,000 pounds gross weight and the velocity at 60 feet a second (40.9 miles an hour), and the power stored up in the moving mass will be

$$\frac{450,000 \times 60 \times 60}{64} = 25,800,000 \text{ foot-pounds.}$$

In order to appreciate the effect of this quantity producing impact, I mention that Krupp's 500-pound rifled gun furnishes at its muzzle a quantity of mechanical power equal to 11,300,000 foot pounds. The shell at 1,200 yards from the muzzle penetrates an armor consisting of 8 in. rolled iron, two plates of iron 2 in. each, 12 in. of teak-wood and 24 inches of oak, in all 48 inches.

We shall now suppose our train to be running centrally against a 270-feet railroad bridge. If both bridge and train

were considered as non-elastic bodies—and remembering that a 270-foot single-track railroad bridge weighs with timber 450,000 lbs.—we would find that train and bridge would start a joint movement under a velocity of 30 feet a second, and both would fall into the river. If the train, as in reality it would, were to run only against one truss, there would be produced a rotary motion, and the lateral bracing would at once be torn to pieces.

But all bridges and trains are destructible, and the whole destructive effect in our example is 12,650,000 foot-pounds.

If one half of this destructive effect fall upon the train, there is probably just as much chance for loss of life, whether the bridge is indestructible or not. It is indifferent whether the bridge is destroyed when it falls into the river or before it falls into the river.

Let us now consider a detail example referring to the strength under impact of a vertical end post of a 200-foot double-track railroad bridge built with two trusses only.

We assume the height of bridge equal to 24 feet, the cross-section of the post as 72 square inches, the point of impact four feet from the bottom. We further assume that the end points of the post are really made immovable, and that the shape at its section is that of a hollow, well riveted round column, the strongest form for the purpose that we have.

It is true that not the whole impact will be consumed by destruction of this single post; but we shall make no allowance for rivet holes, which, as we shall learn hereafter, reduce the strength of a member under impact materially more than would be the case under mere statical forces. We assume further that only one locomotive of 100,000 pounds total weight under a velocity of only 30 feet a second (20 miles an hour) will strike the post.

Since the post weighs not quite 6,000 pounds, the lost labor amounts to 1,300,000 foot-pounds, which figure is obtained by considering the post-mass reduced to the point of impact.

The corresponding formula gives:

$$\frac{S^2}{2E} \times \frac{\text{volume of post}}{6} = \frac{1,300,000}{2} \times 12 \text{ in.}$$

where it is assumed that one-half of the lost mechanical labor is consumed by destruction of the engine, so that only the other half, or 650,000 foot-pounds, acts on the post.

This formula S is strain per square inch, E is the modulus

of elasticity. Now, in calculating the value $\frac{S^2}{2E}$, it must be

observed that, with higher strains (beyond the elastic limit) the modulus decreases rapidly, and therefore it is necessary to determine under this consideration, from actual experiment, the mechanical labor endured by a bar 1 in. square and 1 in. long, which labor is represented by the expression $\frac{S^2}{2E}$. This

labor, indeed, is obtained in the following way:

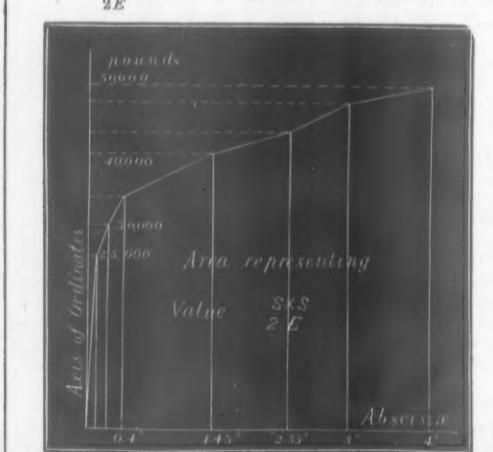
You test a bar 1 in. \times 1 in. square, and 10 feet long under tension; you start with a weight—say 10,000 pounds per square inch—and measure the extension. You now take 20,000, 30,000, 40,000 and 50,000 lbs., when it breaks. Under each experiment you measure the total extension.

Now, then, it is known that mechanical labor is the sum of each strain multiplied into the distance passed over, and which, in our example, is the increase of length produced by a strain.

If we take for example the experiment on tension made by Mr. E. Clark on a bar 1 in. \times 1 in., and 10 feet long (see his classical work: "Britannia and Conway Tubular Bridges," page 373), we shall get:

Up to strains in lbs.	Increase of extension of 10-ft. bar.	$\frac{S^2}{2E}$	$\frac{S^2}{2E}$ reduced to a bar only 1 in. long.
			lbs. per 1 in. square.
25,000	0.10 in.	1,250	10 lbs per 1 sq. in.
30,000	0.10 in.	4,000	33 " " "
34,000	0.20 in.	10,400	87 " " "
40,000	1.05 in.	49,250	411 " " "
42,000	0.90 in.	86,150	718 " " "
48,000	0.65 in.	115,400	962 " " "
50,000	1.00 in.	164,400	1370 " " "

The experiments are represented by the accompanying diagram, and $\frac{S^2}{2E}$ represents simply the surface enclosed by the



curve of extensions and the ordinates, the extensions being indicated by the abscissas.

In our special examples we have this relation:

$$\frac{S^2}{2E} = \frac{1,300,000 \text{ lbs.} \times 12 \text{ in.} \times 6}{2 \times 24 \text{ ft.} \times 72 \text{ in.} \times 12 \text{ in.}} = 2,255 \text{ lbs.}$$

Comparing this figure 2,255 with our table, we learn that the iron tested by Mr. Clark is not capable of standing the shock;

we would have to use a post of more than 120 inches section in order to avoid rupture.

Indeed, we might have anticipated the result, for the labor stored up in the engine at 30 feet a second is equal to the effect of a ram of 35,000 lbs. falling through a height of 40 feet.

If we calculate the mechanical effect sufficient just to destroy the post, we would have found 396,000 instead of $\frac{1,300,000}{2}$ foot-pounds, corresponding with a velocity of 22 feet a second (15 miles an hour). These calculations are still too favorable, for we have not considered the great loss of impact strength caused by rivet holes, nor have we considered that the post would crush in part, nor have we calculated that it can stand 50,000 lbs. of tension, but only 40,000 lbs. of pressure, so that by the latter figure, by reference to our table, instead of the value 1,370, we would have obtained only 411 lbs., which is only one-fifth of the quantity required.

Having now shown sufficiently, as is believed, that there is no salvation for the stability of the best bridge if a train, or only a locomotive, strikes a member directly under even average velocity, the great importance of a good track and precautionary measures on the floor, as well as at each bridge entrance, must be clear to every engineer.

It is true that trains but too often happen to strike the trusses, and that bridges so impacted have stood nevertheless; but in such instances the speed must have been very low, and the respective parts were probably only just touched.

There are bridges with cast-iron top chords and some with wrought-iron top chords and joint boxes that have stood collisions very well. The lower Albany bridge (I relate the case as I have heard it) lost a post, which was knocked out into the river, and yet the top chords, joined by the cast box, did not give way. Indeed, the ignorance of trainmen went far enough to continue the use of the bridge without the post—which danger, however, was soon stopped. This accident could not have happened if the floor of that bridge had not been a very unsatisfactory one, especially as regards the timber work, there being no wooden guard-rails, and the stringers being very nearly below the rails.

There may perhaps be instances of impact on a bridge by which a part of a top chord joint is suddenly opened; but if the connections are made with strong joint boxes with long tubular tenons, they will be as effective as any riveted joint. Previous to the occurrence of such opening of joints, the web will have been destroyed, and such destruction will have consumed a good portion of the impact. And I would mention that the most rigid connections are the least apt to stand shocks; that a certain movability allows a slight motion of parts under impact and thus consumes a portion of the destructive mechanical labor. The lightest top chord of the 200 ft. span considered, under pressure of say 6,000 lbs per inch, the tenons being 6 inches long, is capable of consuming without rupture 144,000 foot-pounds, or more than the very strong end post can stand. The properly made box connection, therefore, proportionally is at least as strong as the rest of the bridge, and more cannot be expected, unless bridges are designed especially to be tested under impact by locomotives.

Many American bridge-builders use top chords without joint boxes, and some of them prefer to splice them continuously; but it is again doubtful whether this connection offers more safety under impact than the tenon connection.

As far as the tensile bottom chords of a through bridge are concerned, there is no reason why they should be designed as compressive members. The floor stringers and guard timbers of any well built bridge answer all purposes for taking up the longitudinal pressure caused by a derailment on the bridge.

Let us now consider riveted tension members under impact. The capacity of a bar to stand tensile shocks is:

$$\frac{\text{Square of strain}}{2 \text{ modulus}} \times \text{volume of bar} = \frac{S^2}{2 \times E} \times V.$$

If the strain surpasses the elastic limit, we have to substitute instead of $\frac{S^2}{2E}$ its value, by reference to experiment. The

formula gives us to understand that a bar of 1 in. section and 1 in. length can stand one unit $\frac{S^2}{2E}$, and the capacity to stand

shock increases proportionally with the length and the section of the bar—in other words with its volume.

This principle is recognized by bridge-builders, who strain floor suspension links lower than long diagonals. Consider a bar of 1 in. section and 20 ft. length. Suppose its ultimate static strength to be 50,000 lbs. According to Clark's exper-

iment, we have the average value $\frac{S^2}{2E} = 1,370$ inch-pounds =

114 foot-pounds. Hence the 1 in. square bar can stand $1,370 \times 20 = 27,400$ foot-pounds.

But now punch into a bar $3\frac{1}{2}$ in. \times 0.4 in. a $\frac{1}{2}$ in. hole, which just leaves 1 in. square iron as before. This bar at the hole is strained with 50,000 lbs. per square inch, when it breaks. But at the moment of rupture all parts except at the rivet hole

are strained with $\frac{3\frac{1}{2} - \frac{1}{2}}{2 \times 0.4} \times 50,000 = 37,700$ pounds, and the

extensions are accordingly. Now the most valuable quality of wrought-iron in standing impacts is its *quality to receive permanent sets*, its *ductility*, which, as it were, is the safety valve under impact. The higher its strain the lower its modulus,

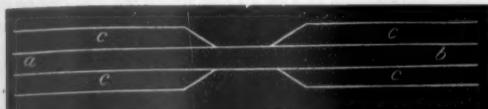
and the larger the quantity $\frac{S^2}{2E}$, which is the amount of mechanical labor it can absorb. If we look at our table

of — we find for a strain of 37,700 lbs. the labor $\frac{S^2}{2E}$ instead of 1,370 pounds under 50,000 lbs. of ultimate strain.

It follows, for the quality of iron considered, that the punched bar can stand only

$281 \times 20 = 5,620$ foot-pounds;

whereas the lighter bar 1 in. \times 1 in. square stood 27,400 foot-pounds. While the punched bar is reduced by only 25 per cent. of statical strength, it is reduced by 79.6 per cent. under impact; the punched bar dynamically is only worth one-fifth of the lighter integer bar.



The bar *ab* without the pieces *cc* is much stronger than with them, the more metal, *cc*, we add, the weaker becomes the bar under impact.

The bar reinforced by *cc* is apparently very strong and stiff, and yet it is very frail.

This illustrates the delusive rigidity of riveted work. I am preparing experiments on riveted joints under impact, and shall soon communicate the results to the profession.

Valuable experiments were made by a French engineer, Mr. Brull, in 1863. He tested chain iron from Guerigny of 1.7 in. diameter, 21 feet long. The cross section of this iron was diminished by degrees with a saw, and each bar was then tested.

These are the results:

Reduction of cross section.	Reduction of efficiency under impact.
1 per cent.	12 per cent.
5 "	27 "
10 "	46 "
20 "	72 "
30 "	85 "
40 "	95 "
50 "	99.95 "

These figures agree very well with our calculation. We will now apply Mr. Brull's table to riveted work, and thus we shall be favorable to rivet work, because chain iron is of such quality and shape as to be materially better than plates and angles used in that class of work.

The experiments by the English Lloyd's, made in 1857, on riveted joints of ship plates of current quality, for double-row riveting, rivet distance, 3 and 4 diameters gave

A gross loss of sectional strength of..... 36.9 per cent.
And a loss of strength on net area of..... 15.1 "

The loss by rivet holes being..... 21.8 "

Experiments by J. G. Wright on diagonal riveting (single-row) resulted in

Loss of strength per gross section..... 35.3 per cent.
Loss of strength per net section..... 31.0 "

Loss of section..... one rivet hole

Experiments at Edgemoor for the Cincinnati Southern Railroad, 3 in. \times $\frac{3}{4}$ in. bars, double-refined, best-best iron, gave these results: Average strength of eye-bars, 50,500 lbs; average strength of machine-riveted joints (3 experiments) per inch area, 36,500 lbs.; loss of strength per net area, 27.7 per cent.; loss of strength per gross section, 42.4 per cent.

Experiments on angles, made for me through the kindness of Mr. H. H. Shreve, at Edgemoor, gave this result:

	lbs.	P. c.
Angle iron stronger, ultimate strength.....	50,600	
Riveted by machine with one leg, to plates, as usual on the cheap plan lattice bridges, ultimate strength		
gross area.....	27,600	54
Ultimate strength net area.....	31,700	62

The same experiment repeated in Watson's shops in Paterson and witnessed by Professor Panayeff, to whose kindness I owe the figures, gave the strength 26,000 lbs. per square inch net area.)

The legs of an angle bent together hot and both riveted to plate (7 rivets each end) gave:

	lbs.	P. c.
Ultimate strength gross area.....	33,100	61.0
Ultimate strength net area.....	41,200	81.4

Fairbairn double-row lap, and double-row double-welt joints, loss of strength per net area, 16 per cent. Average loss of strength of riveted joints:

In regard to gross area..... 39.5 per cent.
" " net area..... 21.1 "

Consequently, loss by holes..... 18.4 "

Applying these figures to Mr. Brull's table, we perceive that the capacity of riveted work for standing impacts would be not even one-tenth of the tensile strength of the gross area, and only 27 per cent. as regards the net area. In other words, eye bars and screw rods with upset ends would stand over ten times greater impacts than the same material put into a riveted bridge.

And here let us learn what an experimenter of the reputation of Knut Stoffe says (page 75). "It will readily be understood how desirable it is, both for economy and security, that the girders and stays employed in the construction of lattice work and suspension bridges should have bosses or swellings at the points where they are penetrated by bolts or rivets."

The results of our investigation give a key to the danger experienced by iron ships touching bottom, and they show that not the pin-jointed butt bridge but the lattice bridge is the really weak thing.

The next question is as to cast joints or not. The very best engineers all over the country, except the exclusively lattice-bridge builders, have used or do use the compressional cast joint boxes in wood and in iron bridges, and I have full confidence in them, provided they are properly designed, as short as possible, of closed box shape, of uniform sufficient thickness of metal, with long, strong tubular tenons.

A European authority, Herr Sternberg, of Karlsruhe, the designer of the Coblenz arch bridge, under date of July 5, 1870, in a letter written to me, stated: "The constructions by suitable castings are very good."

We wish to have proofs that those bridges of cast and wrought iron, which have failed, did so because there was cast iron in them.

An examination of the facts in detail would lead to the discovery that the Schiffkorn Howe truss bridge at Czernowitz in Galicia did not fall from defect in cast iron, but because the trusses had no stiffness as regards their vertical position. The trusses bulged out, bent sideways, crippled and fell, as they

ought to have done. (See Papers of Austrian Engineers, article by Jos. Langer.)

And I will mention that for a similar reason a Peruvian lattice bridge tumbled down twice under a light static load and caused loss of human life, and it did so again from want of what I term transverse stiffness. The riveted trusses, not being held in position, inclined sideways, and the bridge had to fall.

Again, I will mention that in Russia lately a locomotive broke through a cross-beam of a bridge that was considered a well-designed and well-inspected piece of work. The bridge had borne traffic for eight years; a heavy engine had just passed it, but a lighter one fell through a short time after. No previous warning was given. The bridge was one of a lot designed for a new railway by the very "analytical" government engineers, who prescribe and see to having the best iron and workmanship.

Similar breakages on the Reading road some time ago happened with plate girders, which in a short time wore out and broke—a warning as to flimsily-designed riveted bridge floors.

Probably this was due to improper proportions, just as in the cast and wrought-iron bridges improperly used as arguments.

Last summer I had occasion to see a plate girder bridge, under construction for a large railroad over a number of tracks, which refused to carry its own weight and had to be propped up. The design (not originating with any bridge builder) showed a web 28 in. \times $\frac{1}{4}$ in. for a 56-foot span, with flange-plate 12 in. \times 8 in. in the centre, the area of the web, according to book-science, being reduced to one-twelfth of the gross area of the flanges.

Finally, I would cite what Stoney says about improperly balanced riveted joints: "in which case the flange is subject to injurious cross strain and is liable to become broken backed from the compression braces thrusting upward while the tension braces pull it down. In some instances this has produced disastrous results."

Having now shown that it is by no means correct that no riveted wrought-iron bridges have failed, and having shown that at least one of the cast and wrought-iron bridges enumerated has failed from reasons alien to the nature of the material, and having disproved the objections raised against the peculiar American system of pin and butt-jointed bridges, we have reason to be inclined to the belief that other views also of the gentleman who lately assailed the works and character of bridge builders need not be considered.

C. BENDER.

Feb. 11, 1877.

The Location of the Cincinnati Southern Railway.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A letter in your current issue from Mr. James D. Burr, commenting upon my recent article as to the location of the Cincinnati Southern Railway, calls for a few words of reply as to matters of fact. The tone of the letter I shall neither copy nor discuss. There is a proverb as old as the law as to abusing the plaintiff's attorney; but it would be foolish for the latter to lose his temper, and I certainly shall not do so.

Mr. Burr gives the following as his estimate of the cost of 46 miles of line in the Sequatchie valley, for which I allowed only \$3,993 per mile. I amplify his figures merely by adding the corresponding quantities at the average ruling prices:

General grading.....	53,933 c. y. @ 15c.	\$8,000
Masonry and foundations.....	555 c. y. @ \$5	6,000
Girder bridges (Howe truss)..... 60 lin. ft. @ \$20		1,000

\$14,000

The addition of \$1,000 per mile to this estimate for right of way is wholly unjustifiable, even if it were not grossly excessive.

The description given in the "Preliminary Report on Surveys" as to the line through this valley is as follows:

"The valley affords a very level, smooth route for a railway. When once in it the line becomes very smooth and level, with the lightest kind of surface work the whole length of the valley. A few lateral streams cross the line; but small embankments and bridges will raise it above them."

Does any sane engineer use such language about a line which would average as heavy as above?

Abundant reasons exist why the line should be more costly in the Tennessee than in the Sequatchie valley, and why there should be more difficulty in the former from floods and streams: therefore Mr. Burr's comparison of the Sequatchie valley line with the above estimate would have no force under any circumstances; but in stating that it represents the average cost of "Division H," Mr. Burr is either displaying ignorance or guilty of intentional misrepresentation. The official estimate of the cost of "Division H" (made 9 or 10 months after the date when, according to Mr. Burr, the engineers first discovered high-water mark by being drowned out) was as follows:

Grading, per mile.....	\$5,700 70 instead of	\$8,000
Masonry, " "	2,036 89 "	5,000
Bridging (iron), per mile..... 1,651 85 " (wood)		1,000

Total..... \$9,388 94 "

\$14,000

Mr. Burr devotes nearly all his letter to contrasting a single incidental (and carefully guarded) suggestion which I made at the close of my article, as to the possible feasibility of a line down the South Fork of the Cumberland under a different system of location. A sample of his statement of facts is, that "instead of having 6° curves, as on the adopted line, these in the valley would be minimum curves; the maximum would be 20°." Any one who is familiar with the route and alignment of the Lehigh Valley, the Philadelphia & Reading, the Baltimore & Ohio, the Erie, and innumerable other lines through a similar region to that which he describes, needs no demonstration as to the preposterous character of such a statement. His letter may be similarly riddled from end to end, but it can hardly be expected that I should do so at length; for reckless statements as to questions of fact which are capable of such instantaneous disproof show a greater anxiety to make out a case than to get at the truth, even if they do not also indicate that the opinions advanced as to matters of theory and judgment

are, at the best, of dubious value. I am perfectly willing to grant—more than he or any sane man would claim—that the cost of the Sequatchie valley line would have been the same as the adopted line, viz.: \$7,124,550 instead of \$2,773,804, as by my estimate; the real gist and purpose of my article was to show that its superior operating advantages were such that it would have been worth about \$4,500,000 more, when completed. Mr. Burr is doubtless strictly correct in stating that he "has nothing to say as to this portion of the article."

Passing from this unprofitable controversy, however, I cannot neglect this opportunity to again express my keen regret that I have felt obliged to comment unfavorably upon the professional judgment of any one man or body of men. A sense of duty, self-imposed but none the less imperative, has left me no alternative; but, conscious that such criticism, if erroneous, would be an unpardonable injury, and that it is easier to pick flaws than to disprove them, I have studiously endeavored to be cautious and fair. In my forthcoming paper I shall have occasion to comment with perhaps greater severity on the Cincinnati Southern alignment when regarded from another aspect; but I desire to say with all possible emphasis that I do not regard the alignment in question as exceptionally erroneous.

I hasten to grant that the engineers of the line have ample precedent for all that they have done and failed to do. But I have become profoundly convinced that there is no department of engineering of such grave financial importance and so little understood as the art of designing railways. With probable exceptions of which I have no knowledge, all our railways seem to me more or less badly located in an economic point of view, and very many of them shockingly so. I perceive that I lay myself open to all manner of charges of conceit and presumption in such a statement, but I prefer to do so rather than that any one should fancy for a moment that I find a contemptible pleasure in personal criticism. If I am correct in my conscientious belief, it is high time the truth should be made clear. If it is to be made clear, it can only be by selecting for analysis some one line of generally admitted excellence; and if any such is to be selected, what selection could be fairer than this prominent and costly line; which is known of all men; which is in an especial degree an "engineer's" road, and which has been conducted from the beginning with such remarkable efficiency and such admirable and painstaking care?

ARTHUR M. WELLINGTON.

DANVILLE, Pa., Feb. 10, 1877.

The Cost of Reporting Foreign Cars.

The following is a letter addressed to Mr. C. H. Allen, Receiver of the Paducah & Memphis Railroad, by Mr. Wm. D. Basley, the Accountant of the road:

In reply to your inquiry as to the probable effect on office work and expenses of reporting daily to foreign roads the individual movement and mileage of their cars, I beg to submit the following remarks:

It will not be disputed, I believe, that the foreign road which is granted daily access to the source of information as to the movement of its own cars on other lines should itself keep the record of that movement. That is a matter in which it alone is specially interested. I think I may safely go further and say that there is not a road in the country which would not gladly undertake the work of recording the movement of its own cars over foreign roads, if it could obtain the information necessary for the purpose, and thereby definitely locate the position of its own cars. The line which reports daily to other roads would thus be relieved from the duty of recording foreign cars on its books, and also from the vexatious and tedious work of tracing lost cars of foreign roads; for no foreign road which receives daily reports should ask the reporting line to trace any of its cars. The reporting line would be rid of the most laborious and costly branch of its car accounts, and could confine itself to following and recording the movement of its own cars. Any car accountant will appreciate the difference between recording foreign cars and those of his own line. The marks and numbers of the latter are known beforehand and are familiar to him, and his books can be printed or mapped out for recording them in such a manner as to insure such rapidity and ease in doing the work as cannot be attained in dealing with a multitude of cars belonging to many foreign owners.

As an offset, then, against the work of issuing daily car reports, we may place the relief that is earned from keeping up a burdensome and expensive record of foreign car movement, and that without lessening our ability to trace foreign car movement at will.

The daily reports can be rapidly extracted from conductors' returns, with but little time and labor. I find that reports of an average movement of 50 foreign cars per day can be prepared, checked against junction agents' car reports, press-copied and addressed in fifteen minutes. A few hours a day would suffice to dispose of a very considerable car movement. To insure accuracy, it would be necessary, on a long line, to require the train dispatcher to report daily the number of trains run, between what points, and by what conductors, so that all the conductors' reports due should be known to be on file. These conductors' reports should be checked against the car reports of agents at junctions and principal way stations. (In practice I find this absolutely necessary in order to verify the initials, numbers and movement of the cars.) From these conductors' reports, the movement and mileage of individual cars should then be transcribed to the daily reports to foreign roads and the mileage verified by a comparison of the footings of all the reports to foreign roads with the aggregate of the conductors' reports.

Should any line hesitate to discard this record of foreign car movement, and should choose to pursue the more cautious plan of issuing daily reports while still keeping up its established system of accounting, it could test at a small expense, and without disturbing its accustomed routine, the probable cost of permanently adopting the daily report system. It would certainly be well repaid by receiving a return in kind from its connections and being able to record the exact movement of its cars when away from home.

PERSONAL.

—Col. H. T. Douglas has resigned his position as Superintendent of the Petersburg Railroad.

—Mr. Oliver L. Chapman, a well-known railroad contractor, and for several years a director of the Union Pacific Company, died very suddenly in Boston, Feb. 8.

—Mr. Henry J. Southmayd, who was for over 30 years Treasurer of the New Jersey Railroad & Transportation Company, is dangerously sick, and is not expected to live.

—It is reported that the position of General Manager of the Wabash Railway has been offered to Mr. A. L. Hopkins, now Receiver of the Toledo, Peoria & Warsaw.

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Editorial Announcements.

Passes.—All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.

Addresses.—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

GOVERNMENT INSPECTION OF RAILROAD ACCIDENTS.

In our comments on what we supposed to be the bill introduced into Congress by Mr. Garfield at the instance of Mr. Charles Francis Adams, Jr., we had something to say of the collection of railroad statistics by the General Government, assuming that the bill provided for this work, as had been once proposed. An examination of the bill, however, shows that it provides simply and solely for the investigation of accidents by a board of officers of the Corps of Engineers. We publish the bill in full on another page, and with it the letter of Mr. Adams which was submitted with the bill to the House Committee on Railways and Canals, which has authority to report on the subject at any time.

Nothing can be clearer than the scope of the proposed law. The proposed commissioners, three in number, to be officers of the Corps of Engineers, are "to inquire into the number, causes and means of prevention of accidents on railroads in the United States, the number of persons killed or injured thereby, and the most approved means of preventing the occurrence of the same;" also, "to investigate such accidents on railroads as may in their judgment be accompanied by circumstances of an unusual or unexplained character, and specially report upon the same;" and besides these special reports of individual accidents, they are to make at the close of each year "a general report upon the subject of accidents upon railroads in the United States during that year." This is all. The proposed board will have just as much authority as other citizens; no more. Any one now can investigate and report, and some of us do, more or less. The commissioners could request the presence of witnesses at their investigations, but they could not compel it. They could report what might appear to be the causes of an accident, but they could not order those causes to be removed. What, then, would be the advantages of such investigations? The railroad officers and employees might decline examination, and refuse to show plans, drawings, etc., of structures which failed, and the companies might pay no attention to the recommendations of the commissioners. There is a large class which will condemn such a com-

mission as worthless for want of power, and call it so weak as to be contemptible. They cannot conceive of an efficient law unless there is a sword behind it, and unless the administrator holds the sword. These people do not give sufficient weight to some of the influences which work most powerfully on modern minds. Probably enough if some individual, respectable, skillful and disinterested though he might be, should set about the work of investigating an accident, and, in consequence, should attempt to examine the President, Manager, Superintendent, Engineer, and the rest supposed to have most knowledge of the facts, he would not be attended to (though such people sometimes are attended to, and were so notably in the case of the Ashtabula accident); but how would it be if an officer appointed for that purpose by the Government of the United States, and reporting to the law-making power, should undertake the same task? He might have no particle of legal power, but we venture to say that no railroad manager in the country would refuse to grant any needed help to an investigation: he would not dare to. He would know that the country looked to that officer for a report, and that, if he was in any way obstructed in his work, or even was not positively assisted in all reasonable ways, the country would know it, and would be ready to support legislation which would put all needful power, and probably more than needful, and some that might be damaging, behind the officer. A man may defy an individual or even quite a community of disconnected individuals, but he does not defy the whole United States, at least not when he knows that the United States will hear his defiance. It is not likely that the proposed commission would find much opposition to its investigations.

And, as the commission would be engaged in a work of special value to the railroad companies, and would be likely in time to acquire special skill in that work, it would be likely to receive a great deal of support and voluntary assistance from intelligent managers. The latter would be much more likely to look upon the investigating officers as co-operators than if they had power to change methods of operating and compel the adoption of new designs for structures and apparatus.

The commission, however, would hardly escape enmity. It would be its business to tell railroad managers of their faults, which is not a popular task; at least it is not popular with the parties condemned: other people usually rather relish it until they are included in the criticism. And there is, of course, danger that the examiners might turn public opinion in the wrong direction, and recommend what would be more dangerous than the object or method condemned. But that happens now, though of course the report of those supposed to be experts, and bearing an official character, would give great force to opinions, much greater, probably, than is ever exercised in such cases now.

As to the composition of such a commission, more care should be exercised as to the character than as to the special knowledge or ability of its members. The work will not be worth much unless the inspectors have special knowledge of railroad engineering, rolling stock and the operation of railroads, and unless they are men of good minds and thorough general training; but the opportunities for an unprincipled man in such a board would be such that every possible means should be taken to exclude the possibility of the appointment of such persons. It would be extremely desirable that the inspectors should be railroad experts, and their work will not have great value until they become so in a measure. But if the positions were open to civilians, we do not know how the appointment could be limited so as to insure integrity. Men might be placed on the commission, notwithstanding the best efforts of the executive, in the interest of the proprietors of certain patents, or might be attached to such interests afterwards. It is easy to see how valuable to certain parties the recommendations of the inspectors' reports might be made, and it is certain that great efforts would be made to secure such favorable reports, some of them perfectly legitimate, and others, if there was any chance of success, quite the reverse.

In the present state of our civil service, the army is the only body of men in Government service of whose integrity the public feels confident. Feudalism is not impossible with army officers, but it is less probable than with any other class to which appointments could be limited. In this class, distinguished generally for its integrity, is a small Corps of Engineers, the very flower of our military school, securing their position solely by their superior ability as shown during the period of their education. These officers are not railroad men, but they are for the most part excellent engineers, accustomed to responsibility, and frequently employed in special investigations. As inspectors of accidents they would be likely to be careful, patient, thorough, unprejudiced, fearless and perfectly disinterested. If the same men were kept at the work for a series of years, they would become experts in this kind of work, and doubtless be able to discover causes of accidents which, as things now are, are discovered by no one. The British Board of Trade inspectors are an exactly similar body. They have done good work, and to all appearances greatly hastened the introduction

of well-tested and approved appliances in Great Britain, and reduced the number of accidents and lessened the losses by them. Our engineer officers are quite as well qualified for such work, and there certainly is plenty of it to be done.

STRIKES.

The daily papers of the date on which we are writing, Feb. 14, contain reports of a strike of locomotive runners on the Boston & Maine Railroad. Coming so soon after the one on the Grand Trunk, the Central of New Jersey and the Georgia roads, it indicates a wide-spread dissatisfaction at the decline in wages among the men engaged in that occupation. The same dissatisfaction doubtless exists among all of the wage-receiving classes; but locomotive runners seem to be in a position in which they can resist this tendency more successfully than any other class of working people. At any rate, they substantially carried their points in all of the three cases referred to.

The reason why the locomotive runners are able to maintain their demands while other laboring classes are not is because "generally employers can wait longer for labor than laborers can wait for wages, so that however low may be the terms on which they may seek to obtain labor, they can generally, if they are unanimous in insisting on those terms, force them upon needy laborers. This is why the price of labor is generally so much depressed."* In the case of the locomotive runners it happens that they are in a position in which ordinarily they can wait longer for wages than the railroad companies can wait for their services, so that by a little foresight and economy on the part of the men they can easily place themselves in a position in which, if they are tolerably unanimous and united, they have a very decided advantage over the railroad companies. That this should be regarded as a great piece of injustice by those who represent the railroad companies is perhaps not unnatural, just as many tenants in New York city at the present time regard landlords as a body of cormorants who are absorbing the substance of those who pay the rents, while landlords begin to feel that they are unjustly treated when tenants notify them that unless they lower the rents on the first of May they—the tenants—will move. In determining the equity involved in the goring of an ox, a knowledge of which ox is gored often has an important bearing on the decision of a self-appointed judge, especially if he is the owner of one of the beasts. In the present case the railroad companies are in position to be gored, and they very naturally object to it.

It may be said that if the members of the Brotherhood of Locomotive Engineers are not disposed to work on the terms offered by a railroad company, they have a perfect right to refuse, and that then the company can employ others to do its work. But if all or nearly all the men employed on a road belong to an organization, and they all determine to stop work at once, it is not an easy matter to put the engines and trains in the hands of new men without incurring very great risks of accident and causing much delay. A man to be a good locomotive runner must "know the road," and he must also be familiar with the system of signals and the rules and regulations on the line, and also with that unwritten code which almost invariably prevails among the men, to a greater or less extent, on all lines. As the advantage which the men have can only be made use of by a more or less perfect combination among themselves, it has often been attempted to deprive them of such advantage by refusing to employ those who are members of a combination. In the long run this proves futile, however, because the non-union men in time almost invariably find that they have grievances to be adjusted, and they will unite for the same reasons as their predecessors did. It is also a very grave question whether an employer has an equitable right to require a man to surrender the privilege of uniting with others for the promotion and protection of their own interests. Suppose the state of the case should be reversed, and in a strike one of the conditions made by the men was, that the railroad company should have no understanding, agreement or compact with another having for its object the regulation of wages, or that it should withdraw from the Eastern or the Western Railroad Association; it would be pronounced at once as unreasonable, and while the strikers might have a legal right to insist upon such a condition, every one would decide at once that it was very unfair. In the same way a railroad company may have a legal right to refuse to employ any one who goes to the Methodist church or who belongs to some specified political party, but such action would nevertheless be regarded as unwise, and would be contrary to our ideas of social and political freedom. In the same way it is thought that proscription because a laboring man belongs to an organization intended to protect by lawful means his own interests and those of his class, is unjust and oppressive.

There can be no doubt but that strikes of laboring men are often extremely inconvenient, but it must also be remembered that the strikes of employers which are quietly

* From William Thomas Thornton's book "On Labor," published by Macmillan & Co.

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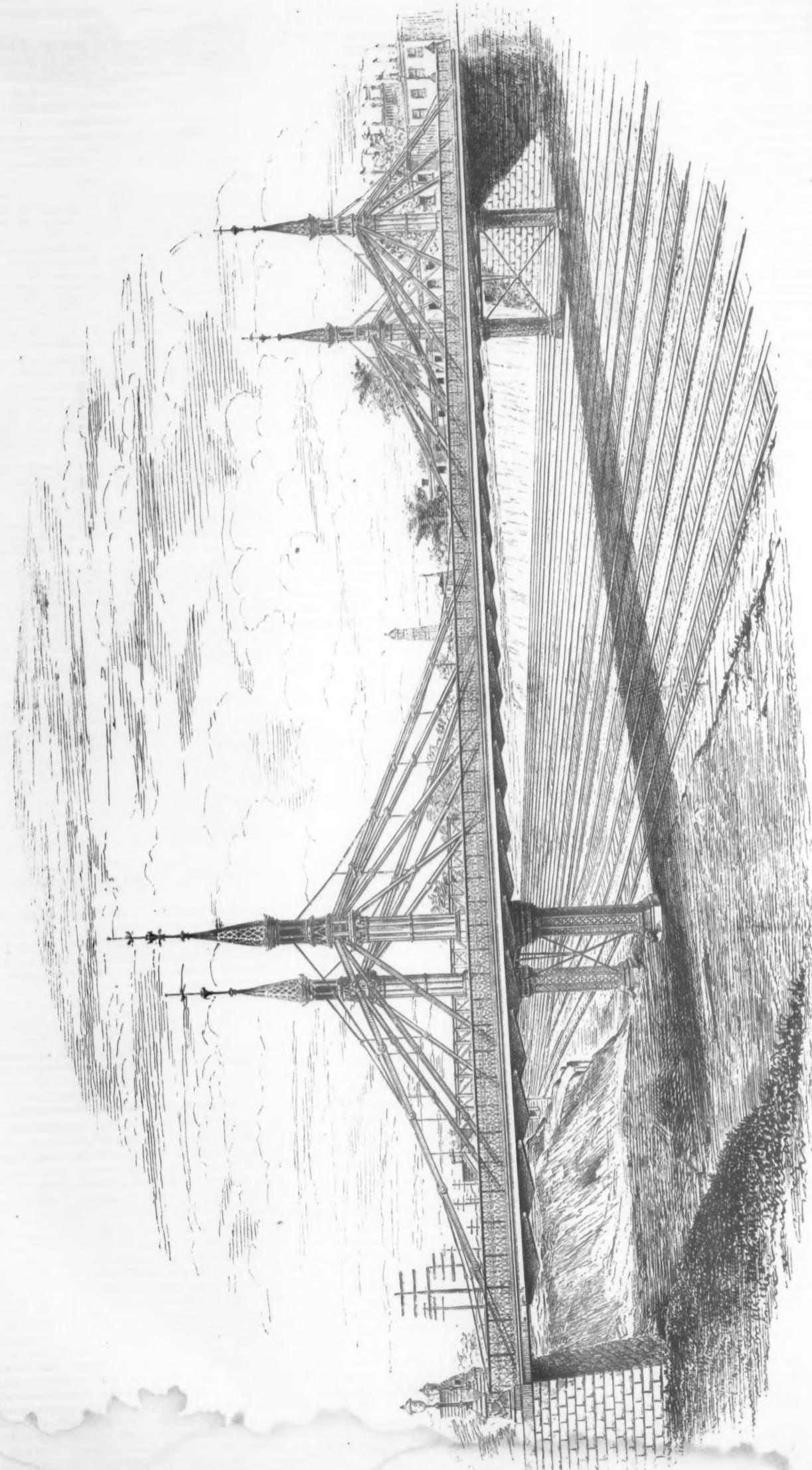
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CARRIAGE BRIDGE, OVER THE PENNSYLVANIA RAILROAD, AT FORTIETH STREET, PHILADELPHIA.

Designed by Joseph M. Wilson, C. E.



organized in comfortable offices are often a cause of very great suffering to those who are so placed as not to be able to resist. It is frequently said that a laborer if he does not want to work is not compelled to, which in one sense is true; but it often happens that the only alternative left him is to take what is offered him or do nothing, and thus have suffering and starvation looking him in the face. There is a large class of people, many of them intelligent people, too, who have never given any thought or study to the "labor question," and if they did, might, perhaps, see but one side of it, who always seem to regard a strike and speak of it as a crime. Now, undoubtedly, a great deal of crime has been perpetrated under cover of trades unions, and has sought the shadow of a strike to conceal itself. In some, perhaps many, cases, too, crime has been instigated and protected by the trades unions themselves, and within the past few days the public has been made to shudder at the perfectly fiendish cruelty of the murders perpetrated by members of what ostensibly was a trades union in the coal regions of Pennsylvania. A hangman's rope is of course the only argument which can be used in such cases; and when any person, whether connected with the Brotherhood of Locomotive Engineers or not, makes the attempt, as was done during the strike on the Central Railroad of New Jersey, to throw a train off the track, the swiftest musket ball would be entirely too merciful to him. The fact is in this nineteenth century we are brought face to face with one of the most difficult social problems that mankind has ever been called upon to solve. With the many blessings which the capacity for organization developed by civilization has given us, there also comes the fact that great accumulations of wealth are placed in the hands of a few persons, or are under their direction. Wealth is power—power to direct the labor of others, to control property; and in a certain sense it gives the right and authority to command. Since slavery has been abolished we do not compel laborers to work for the capitalist, but the laborer is allowed to sell his labor wherever he can do this to best advantage; but, to use the language of the same author from whom we have already quoted, "the employed are placed in circumstances peculiarly unfavorable for the sale of their only staple. In bargaining with employers they stand at a disadvantage, of which the latter do not scruple habitually to avail themselves, generally combining to keep down the price of labor; and even when they do not combine, obtaining it on terms much lower than the laborers would agree to if they and the employers were more equally in need of each other." The conditions under which the laborer can sell his labor become more and more unfavorable with the growth of the system of organization and the concentration of capital and power in a few hands. It is, therefore, not surprising that the laboring men should combine to resist, as best they can, the exercise of the power which is now held by those who have the control of large amounts of capital. At any rate, whether a good reason can be given or not, they have so combined, and it is always the part of true wisdom to recognize existing facts as they are, not as they might, could, would or should be. The question for every railroad manager to realize in dealing with his men is, that they have so combined, that they have done so in every civilized country in the world, and probably will continue to do so until there is some radical readjustment of all our social relations. It is not merely an accidental, local or temporary evil; it is inherent in, and a result of the action of human nature in the present constitution of modern society. When mankind is organized into classes or companies, with diverse interests, it is as inevitable that they will clash and have disputes about their respective rights as it is that individuals will get into similar contentions. It is a vain and delusive hope to suppose that strikes can be crushed out. Their immediate effects may be, it is true, crushed out temporarily by the power which capital gives to the one party when the other is weak for the want of it. During the past ten or fifteen years the efforts of numerous railroad managers have been directed to "breaking up" the organization of locomotive engineers. Such efforts have several times been temporarily successful, but the men, very soon after, quietly reorganized and prepared themselves for renewed contests. There is, under the existing condition of things, no hope whatever that organized effort of working men to protect what they conceive to be their interests can be "crushed out." If that be so, it is the utmost folly to pursue such a policy. What, then, should be done in cases like that existing on the Boston & Maine Railroad? Our reply is, as other civilized people do; submit the differences of opinion existing between the two parties to fair and impartial consideration, and if, after a full statement is made by each, no agreement can be reached, submit the case to disinterested arbitrators, and let both sides agree to abide by the decision.

When such a plan has been proposed, however, the difficulty has presented itself that the men want to be represented by counsel, and the counselor selected is their "Grand Chief Engineer." To this railroad officials

have objected, and consequently the negotiations have in several instances been terminated by a point of official etiquette which we feel compelled to call very unreasonable. The request to be represented by the Grand Chief, or even by a committee chosen from their own number, is at times regarded as an impertinence, and the representatives are treated with great courtesy. "They will have no go-between," the officers say, "betwixt themselves and their men." But what if the men insist on having a go-between? On what pretence are they to be denied the privilege of having their cause argued for them by an attorney? It is high time for masters to free themselves from an obsolete delusion, the relics of which are still darkening their perceptions. In fact, it seems very reasonable that the men should be represented by counsel. The men are generally unlearned, with no experience in argument, or in presenting a case in the strongest and most plausible way, or in the transaction of business; whereas those with whom they are dealing are generally more or less well educated, have had years of experience in the transaction of business, and have all the required command of language and expedients to make the best of their case. The men in dealing with them are therefore at a great disadvantage, which they often feel, and therefore desire to be represented by some one more capable of doing their cause justice than they themselves are. Of course, if the men claim the privilege of being represented by counsel, they must concede the same privilege to their employers, if the latter see proper to make use of it. The apprehension of some railroad officials that they may suffer some loss of dignity or authority, or other prerogative of their position, if they should negotiate with some person whom the men choose to select to represent them, is sometimes amusing. What would happen if such august personages should deign to hear what the representative of the men may have to say has not yet been made clear; but what in reality has often happened when they refuse to see such persons has been, that a strike ensued which could have been avoided, and an expense incurred for their employers which could only be counted by tens of thousands of dollars.

In the face of a strike the question which presents itself is, how can the men best be dealt with? Experience has shown that much the wisest plan is to meet the men or their representatives on grounds of perfect equality, give them a fair hearing and deal with them as one just man and gentleman should always deal with another.

It is of course true that in a strike the men themselves and their leaders will often be guilty of acts of very great folly, and sometimes of crime. It should be remembered, though, by the officers of railroad companies that the men are not highly educated, have little experience in the transaction of business, are not trained either by study or by the knowledge acquired in dealing with affairs to think clearly or discriminate accurately between justice and injustice, and great allowance should be made on that account, and much indulgence exercised towards them in discussing their interests. If those men were learned, had well-trained habits of thinking, and possessed the executive ability which some railroad managers seem to expect of them, then probably the men and the managers would before this have changed places. It is of course to be regretted that the men are not as wise as Solomon; but if strikes had been invented in the days of that distinguished potentate, we feel quite certain that he would have conducted negotiations much more successfully with the strikers than some of our railroad managers have done recently, and that he would not have refused to see or treat with the ambassador sent by the strikers.

That some of the demands made by the men on the Boston & Maine Railroad are unreasonable, and could not be conceded, we think would be decided at once by any disinterested persons to whom a clear presentation of the case was made. The fifth demand, that the oldest engineers in the employ of the company shall have the preference of employment if worthy, that work shall be divided between the men in case there is a surplus of men, and that none shall be discharged without an investigation and the establishment of his guilt, would so interfere with the maintenance of discipline on the road and would be such a serious obstacle to the discharge of the Master Mechanics duties, as simply to make these conditions inadmissible. If, as an example, the Master Mechanic suspected that one of his locomotive runners at times became intoxicated, or was careless, would it be right and proper to entrust a train and the lives of hundreds of people to him, until evidence could be collected "to establish his guilt beyond doubt?" In such cases there can be no time allowed to "establish" guilt; action must be prompt and untrammelled. It is much better that a man, or a dozen men, should lose their places than that the lives of hundreds should be placed in danger.

We see, too, that the police found it exceedingly difficult on Tuesday to prevent assaults upon the men who took the strikers' places. Of course, when the latter place themselves so hopelessly in the wrong as to commit acts of violence, then they must

expect that the kind of arguments which will be used to influence them will be policemen's clubs. But even in view of such acts, it seems as if it would be possible in the enlightened modern Athens for two parties of intelligent men to come together, and to have their representatives present the two sides of the questions in dispute, and then come to some amicable agreement, or, failing in this, agree to submit it to a disinterested board of arbitration and abide by its decision.

Carriage Bridge over the Pennsylvania Railroad.

We present with the present issue an engraving of the carriage bridge constructed last year over the Pennsylvania Railroad at Fortieth street, Philadelphia, from designs furnished by Mr. Joseph M. Wilson, of the firm of Wilson Brothers & Co., civil engineers and architects, Philadelphia, and who is also Engineer of Bridges and Buildings of the Pennsylvania Railroad Company. This bridge, the engraving of which will no doubt recall to the recollection of all Centennial visitors its general features, is designed on what is called abroad the Ordish stiffened suspension plan, the principles of which were, however, developed and published in this country as long ago as 1847 by a well-known American engineer, Mr. S. Whipple, to whom must be given due credit.

The bridge is in three spans, a centre span of 189 feet and two side spans of 69 feet 6 inches each, making a total of 338 feet. It has two trusses with outside sidewalks, the total width being 60 feet, giving a carriage way of 40 feet and two footwalks of 10 feet each. The towers are of wrought iron, covered with an ornamental finish of cast and galvanized iron. The suspension cables are of wrought-iron upset weldless links with pin connections. The main compression and stiffening member is of boiler plate, from which are suspended at intervals the wrought iron built cross girders supporting the longitudinal timber floor joist of the roadway and sidewalks. The roadway and sidewalks are covered with a sub-flooring of two-inch white pine plank, the former having on top a three-inch layer of white oak, and the latter a tongued and grooved flooring of $1\frac{1}{2}$ inch yellow pine planed on the upper surface.

The bridge is on a skew of $62^{\circ} 35' 47''$ to the left.

The anchorages in the abutments resist only the vertical pull from the cables, the horizontal pull being taken on to a compression member forming the lower chord of the boiler-plate stiffening girder. The bridge, with exception of some strictly ornamental work, is constructed entirely of wrought iron, and finished in a highly artistic and ornamental style well suited to its prominent location in a large city.

Aldermanic Ventilation.

There has been a somewhat animated discussion carried on for some weeks past in some of the New York papers, and a good deal of clamor made, to have the street cars warmed. It finally culminated in the appointment of a committee of the Board of Aldermen. This committee, after sitting on the subject, have reached the three following "conclusions," which the Board of Health are requested to see adopted by the street railroad companies. The "conclusions" are:

"First.—The front door of every car must be securely fastened, and never opened from the time the car starts until it reaches its destination.

"Second.—Clean straw must be provided every day for the bottom of each car.

"Third.—The ventilation must be so arranged that impure air may be permitted to escape from the car by some arrangements that will at the same time prevent the admission of cold air."

At these one of the dailies scoffs, and grows merry therewith as follows:

"These rules are to be 'insisted upon.' They must be enforced by the Board of Health, and we trust the peculiarities of the last rule will not be overlooked, for a vacuum in a street car would be a pleasant addition to its actual delights."

It does not seem quite certain that the jeers are deserved. If cold air is not admitted, it will not follow that there will be a vacuum in the car if the impure air escapes, because *warm* air might be admitted. It may be that the "conclusions" of the committee were cunningly devised to secure what is the only practicable way of both warming and ventilating a crowded car in winter—that is, the introduction of a sufficient supply of warmed air.

Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

Chicago, Clinton & Western.—The track was extended 10 miles in 1876.

Potomac, Fredericksburg & Piedmont.—Extended west 10 miles to Orange Court House, Va. It is of 3 ft. gauge.

Galveston, Harrisburg & San Antonio.—Extended from Cibolo River west to San Antonio, Tex., 10 miles.

This is a total of 30 miles of new railroad, 20 miles of it completed in 1877.

A TUNNEL AT DETROIT is again a subject of discussion among Detroit people—more by them, apparently, than by the railroad companies which would use it. This is not due to any lack of a desire for an improved crossing on the part of the railroad companies; they suffer for it daily. But all the companies which would use the bridge are poor. Not one pays a dividend. They have of late years spent millions for new works which bring them in no profit. They cannot get capital for any large additional new work on favorable terms, and some of them would be quite as well accommodated with a crossing elsewhere than at Detroit. The lowest estimate for the cost of such a work is, we believe, \$3,000,000, and evidently the railroad companies have no faith that this amount will not be greatly exceeded. Probably this would not be a high price to pay for an unobstructed crossing, considering the loss of traffic occasioned by the delays which sometimes occur in the present ferry transfer; but corporations, like individuals, are not

always in condition to make profitable investments. The chief users of a bridge or tunnel at Detroit would be the Michigan Central and the Great Western of Canada, neither of which has any money to spare or can borrow on favorable terms.

NEW PUBLICATIONS.

Engineering, which has always given a great deal of attention to American engineering structures, began with the first number for 1877 an elaborate series of papers descriptive of the Pennsylvania Railroad. The papers are intended to give "in the fullest details the whole of the information" concerning "the actual details of an American standard line of railway, of its station and shop arrangements, of its rolling stock, of the nature and extent of its traffic, its organization and management, the cost of working and of maintenance, and the financial results obtained." It is added that "to carry out this programme in its entirety will be the work of many months, and make a large demand upon our space, especially as these articles will be illustrated by drawings showing everything of interest connected with the railway in the fullest detail." The work thus promises to assume the proportions of a treatise on American railroad construction and management in general, illustrated by the particular example of the Pennsylvania Railroad. The character of the work done in *Engineering* is sufficient guarantee that this treatise will be good one, and it will doubtless have quite as much interest for Americans as for Englishmen.

The three papers so far published include a brief introduction describing the territory through which the road extends—virtually the whole State of Pennsylvania—the history of the road, and an account of its organization.

No. 26 of "Van Nostrand's Science Series" is *A Practical Treatise on the Properties of Continuous Bridges*, by Charles Bender, C. E., a little book of 150 pages, which contains a masterly discussion of the subject.

Contributions.

The Quincy Collision and the Train Order.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the *Gazette* of Feb. 2, "H. C." vindicates the order of the dispatcher in the case of the collision near Quincy, Jan. 19.

While I admit that the order was technically correct under the present accepted custom of train dispatching, still it is plain that a very simple precaution on the part of the dispatcher would have saved the collision.

When the order was given, the dispatcher knew that the Chicago, Burlington & Quincy express would go into Quincy before the Toledo, Wabash & Western wild train could depart, and that the express had not yet arrived at Quincy. Suppose his order had been worded as follows: "After C., B. & Q. No. 101 arrives, run wild to Camp Point." This would have called the attention of the train conductor to the train against which he pulled out, and would have saved the collision.

I am perfectly familiar with all the arguments and protestations that can be brought against this suggestion. I have heard them a hundred times, and in all degrees of disputatious heat. Nevertheless, the fact will be admitted by all that this precaution at this particular time would have saved this particular collision.

"H. C." says: "It is supposed that any man employed as a conductor is fully posted upon the time card under which he is running." Only supposition! Supposition used in that way is a bad element in train service, but it is a very good element used in quite another way. Suppose that the dispatcher had supposed that the conductor was not fully posted. If dispatchers will suppose everything to be wrong instead of right, and exert their brains to remedy defects that may exist, instead of supposing that such defects do not exist, then in cases of collision like the one in question their record will always be unimpeachable.

Admit, however, that the conductor is known to be fully posted in a general way upon the time-card, and that he is familiar with the exact circumstances under which this collision occurred, and has experienced them many times. Still there is danger that he may overlook a train on the time-card at any time, but more especially under the conditions now in consideration. The operation of the memory which renders such circumstances more than ordinarily dangerous is rather too subtle for analysis in this place, but may be indicated clearly enough for general comprehension. The conductor has upon his mind the various matters connected with a start from a terminal station—getting the numbers of his cars, checking them up with his way bills, to be sure he has "no way bill without a car and no car without a way bill," examining the condition of cars, seeing that his train is coupled up, etc., so that his mind is more than ordinarily occupied, aside from the question of the running rights of his train. All these things tend to weaken a conductor's memory of his time card. As the bridge men say, they "reduce the factor of safety." There is another danger that is peculiar to the situation described, and is greatest at terminal stations, although it is present, under similar situations, at all stations. A conductor may know well enough that a train is due which he must meet where he is before starting, but the very fact of his getting a running order against some other train may cause him to forget what he knew perfectly, in regard to the first train. I could cite a great many instances of this capriciousness of memory, where trains have been put in danger from this cause.

There is, then, a special danger in the circumstances such as surrounded the conductor of the Toledo, Wabash & Western extra, independent of his merits or defects. The conditions are common, and every experienced dispatcher knows this, or, at least, has no excuse for not knowing it. Therefore it is no answer to argue against the form of train order proposed that "you might as well say it is the duty of a dispatcher to caution

conductors about every meeting point on the road." The situation here considered is a special one, and its conditions do not attach to any other meeting points, and consequently it requires different treatment from all other meeting points. By the way, the vital objection to having dispatchers make all the meeting points is, that they might be more liable to make mistakes than the conductors and engineers, who have a chance of checking each other.

Mechanical train dispatching is very much like clerical work and requires no great exercise of mental ability; but real dispatching is this clerical work combined with watchfulness and judgment to protect the safety and expedite the movement of trains. A thorough train dispatcher cannot be an inferior man. He has ample opportunity to display power of mind and thought, together with prudence and untiring watchfulness. He will never allow a danger to exist if he can prevent it, even if others are technically responsible for it. And he must do this for the love of it and without expectation of full appreciation.

So far I have only considered the bearing of the train order upon this accident; but there is another fault that I have not seen discussed.

How is it that the conductor and engineer of the Toledo, Wabash & Western extra both committed the same mistake? "H. C." speaks of a register kept at Quincy for recording the arrival of all trains. Did the conductor and engineer examine this register? Are engineers in the habit of doing this? Is it not a fact that, as a general thing, they don't do it? Yet the time card holds the engineer equally responsible with the conductor in all matters affecting running rights. I think it will be found that the engineer did not examine that register; and there is another factor of safety gone.

I do not place much importance upon the fact that the conductor had never been over that part of the road before. If he had ordinary train experience, he would be likely to look out more sharply and place less dependence upon his memory than if he were accustomed to the run. It is well known that the oldest and most reliable conductors make just such mistakes on their most familiar runs.

I do not pretend that a dispatcher can insure safety to trains; but I hold that when he has it in his power to avert a danger he should do it, regardless of the technical responsibility of others.

AGE.

Steel and Chilled-Iron Wheels.

BALTIMORE, Md., Feb. 5, 1877.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your articles relating to chill vs. steel car wheels, I do not think your comparisons show the case in its proper light.

We have reliable data on some roads of the performance of chill wheels; for instance, the Lake Shore road, reports of which I have before me, showing the number of 30 in. engine and tender wheels (some thousands) that have been withdrawn from service from various causes, "flat, bad chill or crumpled tread, sharp flanges, broken plates and worn out in service," in other words, wheels put in and taken out of such service during the last three years. These wheels show an average of 45,000 miles. Now this being part of the historical record of the life of 30 in. chill wheels, may it not safely be taken for comparison with what is claimed for steel or steel-tired wheels.

I shall assume that steel wheels will average 400,000 miles for same service, which is certainly as much as we should reasonably expect. I shall also assume that they will run 135,000 miles before requiring turning off, and that they will bear three turnings and average 90,000 miles for each turning. Allowing this, I propose to compare such record with actual facts, as we have them.

As nearly all our roads are conducted on borrowed capital, we will suppose for comparison that both the chill and steel wheels are bought on credit, and allow 6 per cent. for use of money, paying present prices for chill, and for steel prices furnished you by Baltimore & Ohio Railroad Company \$56.16 per wheel; fitting, \$2 per pair, and turning \$2.52 per pair.

To compare the two systems, we must take the service of engines at about 30,000 miles per year, this being the greatest mileage I find for any class of engines as now used. This would cause the renewal of chill wheels every 18 months, or nine times to make say 405,000 miles, at a cost of 27 cents per thousand miles, while the steel wheels would show after 14 years' service to have cost 32 cents per thousand miles, making a difference of 20 per cent. in favor of the chill system; nor is this all, we have another important factor; less capital to run chill wheels.

To equip an engine and tender with steel wheels would cause

first outlay of \$1,402.08 per engine for steel against \$324 for chill, and an average outlay per year for 14 years (the assumed life of steel) of \$2,436 for steel against \$1,465.20 for chill per engine.

Of course, with an increased mileage per engine per year, we decrease comparative cost in favor of steel. I make below comparative statement, supposing the mileage to be increased 50 per cent., or to 45,000 miles per twelve months; even then we do not get cheap service from the use of steel, viz.:

Years.	Miles.	Per pair chill.	Per pair for steel.
1	45,000	\$27.00	\$116.84
2	90,000	43.62	123.85
3	135,000	61.23	131.85
4	180,000	79.90	141.67
5	225,000	99.69	150.17
6	270,000	110.67	161.80
7	315,000	132.30	171.50
8	360,000	155.23	183.31
9	405,000	179.31	194.30
Total.		\$888.95	\$1,375.29
Less old material.		10.00	10.00
		\$878.95	\$1,365.29

44.27 cents per pair for chill wheels per 1,000 miles.

22.13 " wheel " " "

47.97 " pair for steel " "

23.98 " wheel " " "

As shown, the steel wheel will cost more (even admitting the

large average of 405,000 miles), being 23.98 cents per thousand against 22.13 cents per thousand for chill, and we still require the first large outlay of \$1,402.08 against \$324, while the average cost per year per engine for nine years (time required to run the 405,000 miles), will be \$1,820.28 for steel against \$1,171.92 for chill.

It may be possible to find a service for engines or cars, where they can make large mileage in short time, where the steel wheels will compare favorably, as to cost per mile. In engine service considered above, we would have to make 17 miles every hour of 300 working days, or 135,000 miles per engine per year.

As yet, even the greatest claim made does not lead me to think otherwise than I always have, that a good chill wheel is the cheapest, safest and best yet invented, and I have no doubt the wheel-makers will so maintain it.

W. S. G. BAKER.

The Railroad Accident Inspection Bill.

Some comments made in these columns last week on the bill for the investigation of railroad accidents, introduced in Congress by Mr. Garfield, Feb. 1, assumed, erroneously, that it provided for a bureau of railroad statistics as well as for the investigation of accidents by the General Government. Below we give a copy of the bill, prefaced by Mr. Garfield's remarks on introducing it, and followed by the letter of Charles Francis Adams, Jr., accompanying the bill, which he drafted.

Mr. Garfield said:

"I ask unanimous consent to introduce and have referred to the Committee on Railways and Canals a bill to provide for the more thorough investigation of accidents on railroads. No member of the House needs to be reminded of the dreadful railway disaster that occurred at Ashtabula, in my district, a few weeks since, surpassing in its accumulation of horrors any that has ever occurred in the history of railroads. The bill provides for means to inquire generally into the causes of such accidents, and to obtain such information on the subject as may enable the engineers of the country to devise new safeguards for the traveling public. I understand the committee has the general subject under consideration. The bill was drafted at my request by Charles Francis Adams, Jr., of Massachusetts, who is perhaps more thoroughly acquainted with the great questions connected with railroads than any other American. I submit with the bill a letter from Mr. Adams, which I think will be of value to the committee and to the House.

"It has been suggested that a special bureau should be created by Congress to procure statistics upon the subject. But I do not think that is necessary. It has been a fault in our legislation in recent years that we have multiplied bureaus too much. The bill I offer assumes no authority over railroads and creates no new national office. It requires a board of officers of army engineers to examine and report upon such accidents especially as result from constructions of engineers. I should be equally well pleased if the duty were enjoined upon the commission recently created for the purpose of testing iron and steel. Up to the present moment, the cause of the Ashtabula disaster does not appear to have been ascertained. The questions of practical engineering science involved in that accident are of the highest importance, and I hope Congress will aid in making such inquiries as may solve it. I ask that the bill and letter may be published, and I move that the Committee on Railways and Canals may have leave to report on the subject at any time."

There being no objection, the bill (H. R. No. 4,538) to provide for the more thorough investigation of accidents on railroads was read a first and second time, ordered to be printed, referred to the Committee on Railways and Canals, with authority to report at any time, and ordered to be printed in the *Record* with the accompanying letter. The bill and letter are as follows:

THE BILL.

A bill to provide for the more thorough investigation of accidents upon railroads.

Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, That the President of the United States is hereby authorized and requested to appoint a board of three commissioners, who shall be officers of engineers of the Army, to inquire into the number, causes, and means of prevention of accidents on railroads in the United States, the number of persons killed or injured thereby, and the most approved means of preventing the occurrence of the same. And it shall be the duty of said commissioners to hereafter investigate such accidents on railroads as may in their judgment be accompanied by circumstances of an unusual or unexplained character, and specially report upon the same.

Sec. 2. That the commissioners appointed under this act shall, in addition to their pay as officers of engineers of the Army, receive compensation for actual travel and other necessary expenses incurred in the duties herein designated.

Sec. 3. That, in addition to all special reports from time to time made, the commissioners herein provided for shall at the close of each year forward to the Secretary of the Treasury a general report upon the subject of accidents upon railroads in the United States during that year, which report, together with any special reports which the commissioners may have made during such year, shall be submitted to Congress.

MR. ADAMS' LETTER.

In compliance with the suggestions contained in your favor of the 20th instant, I herewith send you a draught for an act establishing a national commission to inquire into accidents upon railroads; a national railroad accident commission, if you please.

You will notice that the draught is very simple, and my object has been to carefully avoid all disputed points. I have taken the inspectors of the British Board of Trade as the model and appointed army officers, so avoiding the creation of any new offices.

The commissioners have no executive powers whatever. They can only investigate and report. That is all the British inspectors can do, and all that the Massachusetts commissioners can do, and experience shows that that is enough. They are able to locate responsibility and give publicity.

They cannot summon witnesses, take evidence under oath, or institute any legal proceedings. The commissioners in Massachusetts cannot either, but they have never found these powers necessary.

They cannot call on railroad corporations for reports of accidents or for returns; they must rely for information on State officials, on the newspapers, on the voluntary co-operation of railroad officials. This is a practical defect in the act. It would not, however, be overcome without raising the dangerous question of jurisdiction and State rights. This I thought best to avoid. No one questions the right of the General Government to investigate anything and everything; and where not only citizens of other States, but the United States mails, are continually destroyed through accidents on railroads, the property of the United States instituting investigations into the causes of such accidents ought not to be questioned.

My object has been to carefully avoid trying to draw

up a complete and comprehensive measure. That can only develop itself in its own way. This is simply a seed. If anything comes of it, it can easily be developed in any way which practical experience shall show to be necessary or expedient. New powers can be given as they are practically found to be needed. United States commissioners can be authorized to conduct investigations, summon witnesses, etc. All this and many other things will at once suggest themselves could readily be put in the bill; but I think it is much better without them; they will come as they are needed.

As it stands the act will meet the case, and I do not see how any one can object to it. I sincerely hope you will have the opportunity as well as inclination to press it. Should you offer it, and should it go to a committee, I should be obliged to you if you would hand this letter to its chairman, as I would like to be in communication with him on the measure.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

Paducah & Elizabethtown.—The officers of this road, formerly the Main Line of the Louisville, Paducah & Southwestern, are: General Manager, Gen. R. H. G. Minty; Auditor, R. W. Brown; Cashier, S. Young; Trainmaster and Superintendent of Telegraph, P. Stewart; Master Mechanic, W. D. Robb; Master Bridge Builder, A. Huntsberry; Roadmaster First Division, J. R. Burch; Roadmaster Second Division, H. S. Heywood.

Little Miami.—At the annual meeting in Columbus, O., Jan. 30, the following directors were chosen: A. D. Bullock, C. P. Cassill; Edmund Dexter, W. H. Clement, Henry Hanna, L. B. Harrison, R. A. Holden, H. J. Jewett, J. H. Rogers, J. R. Swan, F. A. McClure, Thomas D. Messler. The board elected H. J. Jewett President; H. Hanna, Vice-President; C. P. Cassill, Secretary; S. E. Wright, Treasurer. The road is leased to the Pittsburgh, Cincinnati & St. Louis.

Chicago & Pacific.—At the annual meeting in Chicago, Feb. 6, the following directors were chosen: T. S. Dobbins, George H. Bowen, J. S. Wilcox, L. P. Hilliard, W. T. Kirk, J. Davis, A. T. Brown. The board subsequently re-elected T. S. Dobbins President; George S. Bowen, Vice-President and Secretary; L. P. Hilliard, Treasurer.

S. Croix & Penobscot.—At the annual meeting in Calais, Me., recently, the following directors and officers were chosen: Directors, George M. Porter, E. A. Barnard, H. F. Eaton, H. N. Hill, W. W. Sawyer; Treasurer, Samuel Black; Clerk, Frank Nelson.

New York Central & Hudson River.—The following circular bears date Feb. 8: "The Paymaster's Department of the New York & Harlem Railroad Co. has been transferred to the Office of the New York Central & Hudson River Railroad, and organized to include both companies with Mr. Chas. Reed, Paymaster, and Mr. Charles M. Simonson, Assistant Paymaster. Communications to be addressed to room 15, Grand Central Depot, New York."

Burlington, Monmouth & Illinois River.—At the annual meeting in Monmouth, Ill., Feb. 5, the following directors (one-third of the board) were chosen: D. P. Phelps, John N. Brun, Samuel Douglas.

Spring Hill & Parrsboro.—At the annual meeting in St. John, N. B., Feb. 6, Edwin Fisher was re-elected President, with the following directors: Wm. Magee, George F. Smith, R. P. McGivern, John Taylor, George McLean, John McMillan; Auditors, A. McElroy, Seely James, R. Ruel.

Empire Transportation Co.—Mr. George W. Ristine has been appointed General Freight Agent of this company (Empire and Green lines) vice Wm. F. Griffiths, Jr., resigned, to accept other service. His office will be No. 1,127 Girard street, Philadelphia, Pa. The appointment took effect Feb. 1, but he will also continue to perform the duties of Western Superintendent with office at Cleveland, O., until March 1. George W. Cross has been appointed to succeed Mr. Ristine as Western Superintendent with office at Cleveland, O. The appointment to take effect March 1, 1877.

Colorado Pacific.—The first board of directors is as follows: B. F. Hughes, D. M. Edgerton, D. H. Moffat, Jr., W. H. Cheeseman, L. H. Eicholtz, J. S. Brown, G. W. Clayton, L. C. Ellsworth, J. W. Smith. The office is in Denver, Col.

Paulding & Cecil.—At a meeting held in Paulding, O., Feb. 5, Col. S. R. Mott was chosen President and A. H. Seiden, Secretary.

Petersburg.—Capt. R. G. Pegram has been appointed Superintendent in place of H. T. Douglas, resigned.

Portland & Rochester.—Mr. George P. Westcott has been appointed Receiver and has filed the required bonds and taken possession. He is President of the company.

Waynesburg & Washington.—The new board has elected J. G. Ritchie, President; Wm. S. Bryson, Robert Horn, Vice-Presidents; L. K. Evans, Secretary and Treasurer.

Mount Pleasant & Broad Ford.—At the annual meeting in Mount Pleasant, Pa., Feb. 2, Charles Donnelly was chosen President, with the following directors: John King, Jr., Wm. Keyser, Mendes Cohen, Hugh Sisson, Charles Webb, George R. Dennis, E. K. Hyndman, Daniel Shupe, Wm. S. Bissell, Wm. Baldwin, G. B. Rathfon, J. B. Washington.

S. Johns.—Maj. R. McLaughlin has been chosen President. His office is in St. Augu-tine, Fla.

Providence & Worcester.—The new board has re-elected Wm. S. Slater, President; John R. Balch, Clerk and Treasurer; Wm. D. Hilton, Superintendent. Mr. Albert S. Griggs has been appointed Master Mechanic, in place of Joseph Kelly, resigned.

Chester & Chester.—Mr. W. H. Hardin has been chosen President, in place of J. A. Hazeltine, resigned. The office of the company has been removed from Lancaster to Chester, Pa.

Southbridge & Brookfield.—This company has been organized with the following officers: President, C. A. Dresser, Southbridge, Mass.; Secretary, J. M. Cochran, Southbridge, Mass.; Treasurer, C. A. Paige, Southbridge, Mass.; General Manager, John Gilman, East Brookfield, Mass.

Logansport, Crawfordsville & Southwestern.—At the annual meeting in Crawfordsville, Ind., Feb. 3, the following directors were chosen: S. D. Schuyler, R. B. F. Pierce, T. N. Rice, J. E. Martin, J. Collett, John S. Brown, A. H. Bevis, Joseph Milligan, Wm. R. Carter, John G. Clark, J. H. Paris, F. W. Jones, D. M. Perry.

New London Northern.—At the annual meeting Feb. 6 the following directors were chosen: Wm. W. Billings, Wm. H. Barnes, Benjamin Stark, Augustus Brandage, Robert Coit, J. J. Harris, New London, Conn.; Charles Osgood, Norwich, Conn.; Thomas Ransdell, Windham, Conn.; Wm. H. Hill, Boston; Frederick Taylor, Wm. Allen Butler, New York. The only new director is Mr. Harris, who succeeds H. P. Haven, deceased. The board re-elected Charles Osgood President; Robert Coit, Secretary and Treasurer.

Clinton, Fitchburg & New Bedford.—At the annual meeting in South Framingham, Mass., Feb. 6, the following directors were chosen: Wm. J. Rotch, Wm. W. Crapo, New Bedford, Mass.; Henry N. Bigelow, Clinton, Mass.; Charles T. Crocker, Fitchburg, Mass.; Lyman Nichols, Nathaniel Thayer,

Nathaniel Thayer, Jr., George A. Torrey, Wm. B. Wood, Boston.

Boston, Barre & Gardner.—At the annual meeting recently the following directors were chosen: Levi Heywood, Charles Heywood, Gardner, Mass.; Nelson D. White, Winchendon, Mass.; Isaac N. Ross, Holden, Mass.; Lewis Barnard, Calvin Foster, Wm. H. Morse, Charles B. Pratt, Wm. W. Rice, Stephen Salisbury, Worcester, Mass.; Ginery Twichell, Brookline, Mass.

Philadelphia & Erie.—At the annual meeting in Philadelphia, Feb. 12, the following managers were elected: Robert Thompson, Samuel G. Lewis, Strickland Kneass, Joseph W. Gaskill, J. N. Dubarry, A. J. Derbyshire, Alex. Biddle, Samuel G. Thompson, J. Alex. Simpson, Wistar Morris. Mr. Robert Thompson was chosen President.

Schuylkill Navigation.—At the annual meeting in Philadelphia, Feb. 13, Frederick Fraley was re-elected President, with the following directors: John N. Hutchinson, Charles W. Wharton, George Brooke, Charles Baber, Michael Ward, Robert R. Patton. The board elected Richard Wilkins Treasurer.

Pennsylvania Canal.—At the annual meeting in Philadelphia, Feb. 13, Isaac J. Wistar was chosen President, with the following directors: Thomas A. Scott, George B. Roberts, Wistar Morris, Josiah Bacon, William Anspach, M. Hall Stanton, James P. Steiner, Samuel M. Felton, Strickland Kneass, Alexander Biddle, A. J. Cassatt.

Central of New Jersey.—The Chancellor of New Jersey has appointed Mr. Francis S. Lathrop, of Madison, N. J., Receiver in proceedings in insolvent begun against the company. Mr. Lathrop is a well-known business man, is President of the Union Mutual Insurance Company of New York and one of the lay judges of the New Jersey Court of Errors and Appeals.

Boston & Albany.—At the annual meeting in Boston, Feb. 14, the following directors were chosen: Chester W. Chapin, Springfield, Mass.; Henry Colt, Pittsfield, Mass.; Edward B. Gillett, Westfield, Mass.; D. Waldo Lincoln, Worcester, Mass.; Ignatius Sargeant, Brookline, Mass.; John Cummings, Woburn, Mass.; George O. Crocker, New Bedford, Mass.; Moses Kimball, Boston. The only new director is Mr. Cummings, who has long been a director of the Eastern Company, and who replaces Hon. Ginery Twichell, a director of the Boston & Albany since the consolidation, and previously President of the Boston & Worcester.

THE SCRAP HEAP.

Railroad Manufactures.

The Allegheny Car & Transportation Co., at Swissdale, Pa., is building 100 refrigerator cars for the Pennsylvania Company.

The St. Louis Bolt & Iron Co. has taken a contract for 120,000 rail joints for the Chicago & Northwestern road.

The Louisville Bridge & Iron Co. has contracts with the Nashville, Chattanooga & St. Louis Company for two spans, 160 feet each, of iron truss bridge over the Little Sequatchie River on the Sequatchie Valley Branch, and one span, 200 feet, iron truss over Stone River on the Tennessee & Pacific Railroad.

Mr. C. S. Heywood, Superintendent of the Fitchburg Railroad, has about 20 of his patent snow-plows in use on the Flint & Pere Marquette, the Framingham & Lowell, the Chicago & Michigan Lake Shore, the Wisconsin Central and other roads. It is said that these plows have been run at the rate of 40 miles an hour over track covered with heavy snow.

The Cambria Iron Co., at Johnstown, Pa., has taken a contract for 3,000 tons of steel rails for the Louisville & Nashville road.

Waterman & Beaver, at Danville, Pa., are running their rail mill to about one-half its full capacity.

The Philadelphia & Reading Coal & Iron Co.'s rolling mill, at Reading, Pa., started up Feb. 5, after a stoppage of two weeks.

The North Chicago Rolling Mills are running full time both in the steel and iron rail mills.

The Iron & Steel Co.'s Works, at Ironton, O., resumed work last week, after a short stoppage.

The Laconia Car Co., at Laconia, N. H., has resumed work, and is now employing about 150 men on orders lately received.

Bowers, Maher & Brayton, at Cleveland, O., have about 70 men employed, principally on heavy wheels for passenger cars.

The Tuscarawas Coal & Iron Co. is making extensive repairs on its furnaces at Canal Dover, O. The repairs will soon be finished, when the furnaces will go into blast.

The United States Metallic Packing Co., whose office is at No. 160 Congress street, Boston, has introduced its packing on some 20 roads, including the Boston & Albany, the Fitchburg, the Indianapolis, Cincinnati & Lafayette, the Cincinnati, Hamilton & Dayton, the Allegheny Valley, the Pittsburgh, Cincinnati & St. Louis, the Lake Shore, the Wabash, and others. The company claims that its packing can be applied to piston and valve rods and pump plungers at small expense, and will run long time without renewal.

The Newark Iron Co. offers its rolling mill at Newark, Ohio, for sale.

The Portland Company, at Portland, Me., recently sold seven engines to the Whitby & Port Perry road in Canada.

The Rhode Island Locomotive Works, at Providence, recently delivered a new engine to the Boston & New York Air Line road.

The Altoona Shops of the Pennsylvania Railroad recently turned out six new postal cars of an improved pattern.

The Atlantic & Great Western railroad foundry at Kent, O., is very busy on car wheels.

Car Works for Sale.

Mr. N. C. Scoville, Trustee, offers for sale the works of the Buffalo Car Co., at Buffalo, N. Y. The property includes 12 acres of land with substantial brick buildings with slate roofs, fully equipped with tools and machinery, and ready for immediate use. The works have a capacity of 12 cars per day and have railroad connections of both 6 ft. and standard gauge.

Detroit Tunnel.

Several meetings have been held in Detroit to consider this project, and various propositions have been made to construct a tunnel. One made some time ago by Gen. Wm. Sooy Smith has been disclosed heretofore. He, we believe, proposed to build the tunnel and take his pay after its completion, as Captain Eads does with his jetty works. At a recent meeting, however, General Smith is represented as having said that he had obtained pledges from capitalists to advance the money, "provided they were guaranteed the interest," which, of course, capitalists are always only too glad to do. Mr. P. H. McWilliams proposes to construct a tunnel by excavating in both directions from a crib in the middle of the river, build up an island around the crib with the materials excavated, crown it with a lighthouse and make it a pleasure resort. Mr. Eugene Robinson has a plan for constructing the tunnel by the aid of a portable coffer-dam, which would be sunk in place and moved forward as the excavation was completed under it. He proposes to make a tunnel 20 ft. in diameter for \$3,500,000, and take \$500,000 of it in the tunnel company's stock. Mr. Chesbrough advocates the construction of a tunnel according to his original design, illustrated in April, 1870 in the very first number of the *Railroad Gazette*. This provided for two parallel tunnels for tracks and

a small drainage tunnel below, and the latter was excavated half way across the river. The material was found less favorable than had been hoped, and the company refused to continue the work, deeming it too expensive, or rather too likely to be so to justify undertaking it. Mr. James F. Joy, who suspended the work on this project, has recently expressed his opinion that it is more likely to be successful than General Smith's plan, and less expensive.

TRAFFIC AND EARNINGS.

Railroad Earnings.

Earnings for various periods have been reported as follows:

	Year ending Sept. 30:	1875-76.	1874-75.	Inc. or Dec.	P. c.
Boston, Barre & Gardner	\$158,476	\$151,757	Inc. ..	\$6,719	4.4
Expenses.....	120,502	105,296	Inc. ..	15,207	14.4
Net earnings.....	\$37,974	\$46,462	Dec. ..	\$8,488	18.3
Earnings per mile.....	2,990	2,918	Inc. ..	72	2.5
Per cent. of exps.	76.03	69.38	Inc. ..	6.65	9.6
Eastern.....	2,470,971	2,827,291	Dec. ..	\$36,320	12.6
Expenses.....	1,787,277	2,068,873	Dec. ..	282,496	13.6
Net earnings.....	\$683,594	\$757,418	Dec. ..	\$73,824	9.8
Earnings per mile.....	8,763	10,062	Dec. ..	1,300	12.9
Per cent. of exps.	72.33	73.21	Dec. ..	0.88	1.2
Year ending Dec. 31:	1876.	1875.			
Burlington, Cedar Rapids & Northern	\$1,128,071	\$1,311,377	Dec. ..	\$18,300	14.0
Expenses.....	869,845	846,286	Inc. ..	23,559	2.8
Net earnings.....	\$258,226	\$465,091	Dec. ..	\$206,865	44.5
Per cent. of exps.	77.11	64.55	Inc. ..	12.56	19.5
Chicago, Burlington & Quincy	12,003,950	11,791,361	Inc. ..	212,589	1.8
Expenses.....	6,342,232	6,430,123	Dec. ..	87,891	1.4
Net earnings.....	\$5,661,718	\$5,361,238	Inc. ..	\$300,480	5.6
Per cent. of exps.	52.84	54.53	Dec. ..	1.69	3.1
Cleveland, Mt. Vernon & Delaware	376,893	426,027	Dec. ..	49,974	11.7
Expenses.....	305,715	329,361	Dec. ..	23,646	7.2
Net earnings.....	\$70,338	\$96,666	Dec. ..	\$26,328	27.2
Per cent. of exps.	81.30	77.31	Inc. ..	3.99	5.3
Des Moines & Minnesota	59,757	56,386	Inc. ..	3,369	6.0
Expenses.....	31,677	31,677	Inc. ..	-----	-----
Net earnings.....	\$28,080	-----	-----	-----	-----
Per cent. of exps.	52.79	-----	-----	-----	-----
Detroit & Milwaukee	97,455	\$902,647	Inc. ..	\$74,908	8.3
Expenses.....	885,166	868,461	Inc. ..	16,705	19.2
Net earnings.....	\$92,289	\$34,186	Inc. ..	\$58,103	109.9
Per cent. of exps.	90.55	96.21	Dec. ..	5.66	5.8
Kansas Pacific.....	3,000,799	3,363,760	Dec. ..	362,961	10.8
Expenses.....	1,720,332	1,790,880	Dec. ..	70,548	3.9
Net earnings.....	\$1,280,469	\$1,572,880	Dec. ..	\$292,413	18.6
Per cent. of exps.	57.34	53.55	Inc. ..	3.79	7.1
Louisville & Nashville	5,152,290	4,806,542	Inc. ..	345,748	7.2
Expenses.....	2,093,598	1,914,342	Inc. ..	179,266	9.4
Mobile & Ohio.....	655,915	-----	-----	-----	-----
Paducah & Memphis	207,472	199,210	Inc. ..	8,262	4.2
Expenses.....	141,955	131,623	Inc. ..	10,332	7.9
Net earnings.....	\$65,517	\$67,587	Dec. ..	\$2,070	3.1
Per cent. of exps.	68.41	66.14	Inc. ..	2.27	3.4
St. Croix & Penobscot	40,107	55,112	Dec. ..	15,005	27.2
Expenses.....	21,251	35,369	Dec.		

from Chicago. This tariff is regarded as experimental and is subject to revision. The companies concurring in these rates are the Michigan Central, the Pittsburgh, Fort Wayne & Chicago, the Pittsburgh, Cincinnati & St. Louis, the Baltimore & Ohio and the Grand Trunk.

Pennsylvania Railroad Traffic.

During the month of December the number of cars passing Columbia on the Philadelphia Division of the Pennsylvania Railroad was: East-bound, 37,591 loaded, 1,753 empty; West-bound, 5,831 loaded, 30,466 empty; total, 43,422 loaded, 32,219 empty.

The number of cars passing the same point for the year ending Dec. 31 was: 1876, 854,838; 1875, 776,240; 1874, 684,073; increase, 1876 over 1875, 78,598, or 10.1 per cent.; 1876 over 1874, 170,765, or 25 per cent.

Iron Movement.

Receipts of iron ore and iron at Pittsburgh for the past year were as follows:

	1876.	1875.	Inc. or Dec.	P. C.
Iron ore, tons	208,262	175,596	Inc. .. 32,666	18.6
Pig iron	214,588	173,842	Inc. .. 40,746	23.4
Blooms and muck-bar	15,312	24,998	Dec. .. 9,086	37.2
Scrap iron	41,635	36,768	Inc. .. 4,867	13.2

The entire increase in manufactured iron was 36,527 tons, or 15.6 per cent.

OLD AND NEW ROADS.

New Jersey Midland.

The Receivers report for December total receipts of \$62,806.89, of which \$176.32 was balance from previous month, and \$10,214.01 on loan account. The expenditures were \$62,754.99, leaving a balance of \$51.84. Expenditures outside of current operating accounts were \$7,000 for Middletown, Unionville & Water Gap lease; \$2,912.87 for construction; \$1,061.33 for equipment; \$250 for right of way, and \$4,842.63 on loan account.

The receipts and expenses on current account were:

Passengers	6,691 16			
Freight	27,250 58			
Milk	12,804 59			
Miscellaneous	5,670 19			
 Total (\$610 per mile).	\$52,416 60			
Drawbacks, freight charges, etc.	17,731 58			
 Balance	\$34,684 92			
Working and terminal expenses	29,351 97			
 Net earnings	\$5,332 05			

In addition to the above, which shows only actual cash receipts, there was an uncollected balance of \$2,571.22 due from the Pennsylvania Railroad on December passenger account. The gross earnings show an increase of \$6,664.86, or 14.6 per cent., over 1875.

European & North American.

The Sheriff advertises for sale at St. John, N. B., all the interest of this company in the two ferry boats used for crossing the harbor of St. John; also its interest in the ferry lease and privileges and in the wharf and adjoining real estate in St. John. The sale is to be made under an execution for debt sued out by James R. Ruel.

Ohio & Mississippi.

The reply of the Receivers to the petition for their removal is a general denial of the charges made. Mr. Torrance refers to the charges of bad management as President made against him, and claims that he has always represented the condition of the company fairly in his reports, and that he has managed its affairs honestly to the best of his ability. The purchase of the Springfield Division was, he believes, necessary to prevent diversion of business. He claims that the petition for removal is the result of personal hostility, and is without just cause.

The operations of the Receivers from Nov. 18 to Jan. 31 are stated as follows:

Gross receipts	\$919,236 25
Current working expenses	\$478,893 04
Pay-rolls and other arrears paid	426,274 82

905,077 86

Balance, Feb. 1. \$14,158 39

The gross receipts show an increase of about \$215,000 over a corresponding period last year, which is attributed mainly to improvement in rates.

The Receivers claim that they had no power to prevent the default of Jan. 1 on the first-mortgage bonds, and that they had no funds for that purpose after the payment of preferred claims ordered by the court.

St. Paul & Pacific.

The assertion having been made in the Minnesota Legislature that the Northern Pacific Company would complete the Brainerd Branch if allowed to do so, J. S. Kennedy & Co., agents for the Dutch bondholders, have written a letter, of which the following extracts contain the substance:

"We beg to state most emphatically that no such proposition has ever been made or discussed in any of the frequent interviews, or in any of the correspondence which we have had with the Northern Pacific Company. * * * *

"The only proposition ever made by the Northern Pacific Company was, that they would consent to our taking our decree, provided we would agree that after reorganization of the company we would build the Brainerd Branch, thereafter the line to St. Vincent, and lease these pieces of road to the Northern Pacific Company in perpetuity, or give them practically the control of the lines thus to be built, and secure for them the right to operate and use the branch line to St. Paul.

"They have also demanded that we would agree never to build the line from Breckinridge to Barnes or Glyndon, or at least for a term of years.

"Failing in this, we have always been given to understand that they would resist the foreclosure suit to the last minute, taking advantage of every possible form of delay, technical or otherwise, known to the law.

"We have proposed to them that the Northern Pacific Railroad Company should have every facility over our lines, that we would make a most favorable contract with them for the interchange of business, and that we would do everything we could to secure to them equally good running arrangements over the First Division Company's lines, and further that their stock interest should be represented in any new organization. This, they have stated, would not satisfy them; that the Manitoba business was essential to their existence, that they must control it to Duluth, and to do so must control it to St. Paul; that this was life or death with them, and of course they should struggle for it to the last, and they must have some responsible guarantee that the Breckinridge-Glyndon line would not be completed, at least for a term of years, as that connection would destroy them.

"We have represented our utter inability to guarantee any such thing, even if we were disposed to do so, and the worthlessness of any such guarantee as that demanded, even if made; whereupon they have stated that our position was a threat to them, and they should fight us as long as they could, as delay was so much gain to them, the object of the Northern Pacific Company being to take the Manitoba business and the business on their lines west of Red River to Duluth, while our object has been and is to bring it as much as possible to St. Paul and Minneapolis. * * * *

"No proposition of any kind was made by them to build or assist in building the Brainerd Branch. Their wishes, as far,

as we could gather them, were that we should agree to build the line to Brainerd first, then the line to St. Vincent, agree not to build the Breckinridge-Glyndon line, or the line from Melrose to Glyndon, which they stigmatized as a worthless and useless piece of road, and make such arrangements that upon the completion of the lines as indicated they could practically control the northern and western business to the profit and advantage of the Northern Pacific Railroad to Duluth."

Boston & Albany.

At the annual meeting in Boston, Feb. 14, a resolution was adopted recommending the directors to readjust rates and to maintain them at a remunerative point. There was not a sufficient number of votes present to ratify the leases of the Pittsfield & North Adams and the North Brookfield roads, and an adjournment was had to Feb. 28, when a vote will be taken.

Rome, Watertown & Ogdensburg.

This company has a bill before the New York Legislature authorizing it to take up so much of the track of the former Syracuse Northern road as is north of Pulaski, about seven miles. The Syracuse line crosses the line from Richland to Oswego at Pulaski and the connection with the Main Line can be made by way of Richland quite as well as by the existing line to Sandy Creek, and the local traffic can be as well accommodated, making the maintenance of this seven miles an unnecessary expense.

Chicago, Burlington & Quincy.

A large force is now employed in renewing and repairing the bridges on the St. Louis, Rock Island & Chicago Division, many of which are in very bad condition. The road-bed and track are to receive thorough repairs in the spring. The repair work for the division is to be consolidated at the Beardstown shops.

Louisville & Nashville.

Some of the firemen on this road who lately struck and were discharged have attempted to frighten off the new men in various ways. Last week two of them, who had boarded an engine and tried to drive off the fireman, were arrested, and the City Court held them in bonds of \$500 to answer any indictment that might be found against them, and in \$5,000 to keep the peace for one year.

Henderson & Overton.

An engine and several cars have been received and a connecting switch put in at Overton, Tex., on the International & Great Northern road, where tracklaying was to be begun this week.

East Line & Red River.

A contract has been let for another section of 10 miles, which will carry the road to Daingerfield, in Morris County, Tex. Part of the iron and most of the ties for this section are on hand.

Chicago, Quincy & Western.

Surveys have been begun for the section of this road from Beardstown, Ill., westward to Quincy, about 58 miles. The intention is to build this section as a connection between Quincy and the Springfield Division of the Ohio & Mississippi.

Erie.

Receiver Jewett reports to the Court for December as follows:

Balance on hand Dec. 1.	\$583,578 06
Receipts for the month	1,938,088 66
 Total	\$2,522,661 72
Disbursements on all accounts	2,279,358 35
 Balance, Jan. 1.	\$242,908 37

The disbursements exceeded the receipts by \$840,674.69 for the month.

New Jersey & New York.

In Trenton, N. J., Feb. 13, Garret Ackerson, Trustee under the first mortgage of the Hackensack & New York Railroad, made application to the Chancellor for the appointment of a special receiver to collect the bonds. The bonds issued under this mortgage, amounting to \$100,000, are a first lien on the five miles of road from the Erie junction to Hackensack, and the principal became due Jan. 1. The Chancellor refused the motion for a special receiver, but appointed a master to ascertain the amount due and directed the Receiver, who has charge of the whole road, to keep the accounts so that the earnings of the Hackensack & New York road may be stated separately, and to pay over the net earnings to the Trustee on account of the mortgage.

Galveston, Harrisburg & San Antonio.

The terminus at San Antonio, Texas, has been reached at last after long waiting and many delays. The bridge over the Salado was completed last week and by the end of the week the rails were laid to San Antonio, 10 miles beyond the late terminus at the Cibolo River and 212 miles from the eastern terminus at Harrisburg. But little work remains to be done before regular trains can begin to run through, and the road will be formally opened probably this week. The only work to be done to complete the line will then be the branch to New Braunfels.

Cairo & St. Louis.

The six enginemen of this road who were arrested for interfering with trains and for actual or threatened violence during the late strike were tried at Belleville, Ill., last week and found guilty. The Court postponed their sentence for a time, pending the trial of another indictment against them.

Atlantic & Pacific Telegraph.

The United States Circuit Court at Indianapolis has refused to dissolve the injunction restraining this company from building a line of telegraph along the Ohio & Mississippi road. The decision sustains the validity of the Western Union's exclusive contract with the Ohio & Mississippi.

This company gained an important increase to its lines on Feb. 12, when all the telegraph lines and offices on the Baltimore & Ohio, and its branches, were transferred to it to be operated under contract. These lines had previously been operated by the Western Union Company.

Midland, of Canada.

The trackmen and some other employees have struck, and refuse to go to work again unless they are paid up to Jan. 1 at least. The rest of the employees are very uneasy, and it is thought that the strike will become general. The affairs of the road are represented as being in a very bad condition, and charges of inefficiency and even dishonesty are freely made against the management.

Government Contract.

Sesized proposals for dredging and the construction of a dike in Rappahannock River, Va., will be received until noon of Wednesday, March 7, by S. T. Abert, United States Civil Engineer, at Washington, D. C., where specifications and blank forms of proposals can be had on application.

Missouri Railroad Commission.

The State Senate of Missouri has appointed a committee to investigate charges made against the Railroad Commissioners of taking free passes, State officers being prohibited from so doing by the constitution. The Commissioners claim that they have not done so; the extent of their offence is that, being re-

quired by law to inspect personally all the railroads of the State, they have required or accepted from each company the use of a train in order to enable them to make the inspection. They claim that this cannot be considered as the acceptance or use of a free pass, and that it was necessary to take the action which they did, in order to make the inspection.

Boston & Maine.

Recently the enginemen on this road demanded an increase of pay, the rates proposed being \$2.50 per day the first year, \$3 the second, and after that \$3.50 per day for engines on the road and \$3.25 for yard-engines. The rates now in force are from \$2.25 to \$3.40, the runs being from 110 to 130 miles; the company also retains 25 cents per day, which is paid over every three months to those men who have had no accident during that time. Another grievance, which, we believe, was not mentioned, is said to have been the continuance in office of an arbitrary and overbearing engine dispatcher, who was very obnoxious to the men.

The company not having acceded to their demand, the enginemen left work at 4 p. m. on the afternoon of Feb. 12, leaving their trains wherever they might happen to be. Freight traffic was entirely stopped, but some of the passenger trains continued to run, the company having secured some new men, but much delay was caused by the necessity of bringing in the trains left out along the road. The strikers were sustained by the Brotherhood, Grand Chief Engineer Arthur being on the spot and directing their movements. He is said to have threatened a strike on the other Boston roads if they sent any of their men to help the Boston & Maine. No violence was used, but the men succeeded in buying or persuading off several of the new men engaged by the company, and in securing a almost complete stoppage of trains. At latest accounts (Wednesday) both parties were holding out.

Cincinnati Southern.

The discussion of the disposition of this road, when completed is still actively carried on in Cincinnati. The latest expression of opinion is that of the Board of Transportation, which, at a meeting held Feb. 12, passed resolutions in favor of a lease, provided that no lease should be made before the road is completed, and that any lease made should be submitted to a popular vote in the city for ratification or rejection.

Newport & Maysville.

This lately organized company has already several agents along the line securing the right of way. In most cases the land-owners have agreed to give the right of way or take pay in stock.

Western North Carolina.

The North Carolina House of Representatives has passed the Senate bill providing for the completion of this road with an amendment providing that no stock or share in the road shall be given to the stockholders of the old company. The Senate bill provided that they should receive one-fourth share, the State retaining the other three-fourths. It was proposed to give them this as a compromise and in order to prevent litigation on some unsettled questions.

Meetings.

Meetings are to be held as follows:

Housatonic, annual meeting, at the office in Bridgeport, Conn., Feb. 23, at 2:30 p. m.

Northern Central, annual meeting, at the office, corner Calvert and Centre streets, Baltimore, Feb. 23, at 1 p. m.

Dividends.

Dividends have been declared by the following companies: Chicago & Alton, 4 per cent., semi-annual, payable March 1. Columbus & Hocking Valley, 4 per cent., semi-annual, payable Feb. 10.

Central, of New Jersey.

Our report of the stockholders' meeting on Nov. 7 was necessarily incomplete. The committee appointed in the early part of the meeting presented a hastily prepared report, the substance of which was that the floating debt amounted to \$2,543,000, including rentals due, and the indorsements for this mortgage, amounting to \$100,000, of the Central's new blanket mortgage, and \$4,906,000 Lehigh & Wilkesbarre bonds. That company owes the Central \$1,620,000 for freight. The true condition of the Lehigh & Wilkesbarre Coal Company could not be ascertained without more time; it had 200,000 tons of coal on hand. The committee recommended a further investigation.

President Knight stated that everything depended on the taking of the \$3,000,000 certificates of indebtedness. The meeting voted to continue the committee, with instructions to make a thorough examination of the condition of the company. Another committee was appointed to secure subscriptions to the certificates of indebtedness. At the close of the meeting it was stated that \$1,028,100 of these had been subscribed for. These subscriptions are, however, contingent on the whole amount of \$3,000,000 being taken.

A current report that the employees were about to strike for their back pay is contradicted by authority. There has been no intention of striking, though there is now over two months' pay due, a very unusual occurrence, the Central having always been very prompt in paying its employees. Some of them were paid for one month this week.

A meeting of stockholders was to be held Feb. 15 to receive the report of the investigating committee appointed last week.

By arrangement between the parties in interest application was made to the United States Circuit Court in Pittsburgh, Feb. 12, for the appointment of receivers for the Lehigh & Wilkesbarre Coal Company. The Court granted the application and appointed Hon. Benjamin Williamson, of Elizabeth, N. J., a director of the Central; E. W. Clark, of Philadelphia, President of the Lehigh Coal & Navigation Company, and W. H. Tillinghast, of New York, Agent there for the Lehigh & Wilkesbarre Company.

are entertained that the outlay may ultimately be repaid to the country, it may be considered advisable not to press all the works contemplated in the earlier years of the confederation to completion at present. I am happy to state that the Inter-Colonial Railway was opened for traffic throughout its length early in the summer, with as favorable results as could have been expected. One of the immediate advantages of the completion of the railway was the delivery and reception of British mails at Halifax after the closing of the St. Lawrence, and I am happy to say that up to the present time mails and passengers have been successfully carried over the line without any interruption."

Portland & Rochester.

The Maine Supreme Court having granted the application of the city of Portland and other bondholders for a receiver, has appointed Mr. George P. Wescott, President of the company, to that position. Mr. Wescott qualified and took possession of the road last week, but makes no changes in the management.

Grand Trunk.

The Toronto (Ont.) *Monetary Times* says: "Mr. Sergeant, Traffic Manager of the Grand Trunk Railway, has issued a circular desiring the attention of station-masters and the public to a matter which it has been long thought the authorities of that railway carefully neglected, or, at most, attended to only after prior claims of through traffic had been considered. We mean the cultivation of local traffic. The circular acknowledges the importance of this matter; and frankly requests the co-operation of business men and his own officials to the aid of trade, the development of manufactures, the growth of building, etc. We are glad to observe this proof of awakening interest in policy which is likely to result beneficially to the company, as well as to the country."

Cleveland, Tuscarawas Valley & Wheeling.

A special meeting of stockholders was to be held in Cleveland, O., Feb. 14, to consider a proposition for the extension of the road from its present terminus at Uhlerville, O., east by south to Bridgeport, opposite Wheeling, W. Va., on the Ohio, about 84 miles; to vote on the question of increasing the stock from \$1,750,000 to \$2,000,000, and to authorize the execution of a consolidated mortgage for \$2,000,000, of which \$1,000,000 are to be used to take up the outstanding bonds and the rest for the proposed extension and for new equipment. The company proposes to build the extension if the \$250,000 new stock can be taken up along the line.

Boston, Clinton, Fitchburg & New Bedford.

George A. Torrey, Trustee, will receive proposals at his office in Boston for the sale to him of \$11,000 Mansfield & Framingham bonds for the sinking fund.

The affairs of the company are to be investigated by the Railroad Committee of the Massachusetts Legislature, with special reference to the company's application for leave to issue \$2,000,000 preferred stock to fund the floating debt.

Fond du Lac, Amboy & Peoria.

A correspondent writes us that the affairs of this company have been placed upon a better footing and that it expects to build 75 miles of road between Fond du Lac, Wis., and Milwaukee next season.

St. Louis, Keokuk & Northwestern.

The new bridge over the D. S. Moines River at Keokuk, Ia., has been completed and accepted after due inspection. It is both a railroad and a highway bridge, was built by the American Bridge Company, of Chicago, and paid for jointly by the St. Louis, Keokuk & Northwestern Company and the city of Keokuk.

The repair shops at Canton being entirely too small, the company purposes building new ones and has offered to locate them at Keokuk, if that city will give the land required.

Chicago, Danville & Vincennes.

The Illinois Division was sold in Chicago, Feb. 7, under the decree of foreclosure granted by the United States Circuit Court. The sale included the line from Dolton, Ill., to Danville, 106 miles, with the branch from Bismarck to the Indiana line, the interest of the company in the Chicago & Southern road, from Dolton to Chicago, and all the equipment and other property. The property was bought for \$1,450,000 by F. W. Hindleper, T. W. Shannon and John M. Denison, a committee acting for the first-mortgage bondholders.

The Indiana Division, including 23 miles of finished road and some 30 miles of graded road-bed, was sold in Indianapolis, Feb. 9, under a separate decree of foreclosure. It was bought for \$15,000 by the same committee which bought the Illinois Division. It is understood that the purchasing bondholders will organize as soon as the sale is confirmed. It is said that they have made arrangements to complete the road to Brazil, Ind., as originally intended.

Mobile & Ohio.

The bondholders' committee give notice that the agreement of Oct. 1, 1876, has been signed by the holders of a majority of the first mortgage and Tennessee substitution bonds. The committee will continue to receive signatures until March 1, but reserve the right to refuse to receive them after that date without further notice.

Spartanburg & Asheville.

The work of laying track was begun at Spartanburg, S. C., Feb. 12.

Levin & Kennebec.

A meeting of the stockholders was held in Levin, P. Q., Feb. 6, and after an excursion it was resolved to lease the road to Mr. A. Senacal. The claims of the bondholders were disregarded. On the following day writs of attachment were issued out on behalf of the Rhode Island Locomotive Works and the Wason Manufacturing Company, who furnished the equipment. The writs were served on the lessee, but he refused to surrender the cars or engines, and at latest dates still retained possession.

Jersey City & Albany.

The New York Court of Appeals has affirmed the judgment of the Supreme Court, setting aside certain proceedings under which the village of Haverstraw was bonded in aid of this road. The Court holds that the proceedings were informal, and not legally complete.

Chicago & Alton.

The temporary trestle-work erected in place of the two spans of the Louisiana bridge over the Mississippi, which were carried away last fall, was so damaged by the breaking up of the ice last week that trains cannot cross. The permanent bridge is nearly ready for erection, and will be put up as soon as possible. Meantime trains are run by way of Hannibal.

Potomac, Fredericksburg & Piedmont.

The track of this road is laid to Orange Court House, Va., 10 miles beyond the late terminus and 38 miles westward from Fredericksburg.

South Mountain Iron.

Thomas A. Biddle, Trustee, gives notice that he will sell at public sale in Philadelphia, May 15, the property of the South Mountain Iron & Railroad Company, consisting of the Pine Grove iron estate, containing 20,000 acres of iron land in Cumberland and Adams counties, Pa., and a railroad 17 miles long connecting the property with the Cumberland Valley road near

Carlisle. The railroad will be sold free of incumbrance; the property subject to a prior mortgage for \$150,000. The property is sold in satisfaction of a mortgage for \$200,000, and a payment of \$30,000 cash will be required, the balance to be payable in bonds and coupons. The bonds are all held by the Cumberland Valley Company, which will probably buy in the property.

Poughkeepsie Bridge.

The first caisson for the foundation of one of the piers was successfully launched at Poughkeepsie, N. Y., Feb. 10.

Lake Erie & Louisville.

The Indianapolis *Journal* says that this road is to be sold at Fremont, O., Feb. 17. The road is 88 miles long, from Fremont, O., to St. Marys. It was sold and reorganized in 1871, but defaulted again in 1873, and has been in the hands of a receiver for three years past.

Southbridge & Brookfield.

The organization of this company has been completed and arrangements are being made to begin work. The road is to run from Southbridge, Mass., northward to East Brookfield on the Boston & Albany, about 14 miles.

Lafayette, Muncie & Bloomington.

A survey is being made for a branch from Boyleston, Ind., south by east to Indianapolis. The distance is about 40 miles, and if built the branch and the Main Line from Boyleston to Lafayette would make a second line between Lafayette and Indianapolis not very far at any point from the existing one.

Framingham & Lowell.

A New Bedford dispatch to the Boston *Advertiser* says that the coupons due on this company's bonds Feb. 1 were returned unpaid. The funded debt by the last report was \$500,000. The road is leased to the Boston, Clinton, Fitchburg & New Bedford Company, the rental being, we believe, a fixed percentage on the gross earnings.

Wheeling & Lake Erie.

The question of standard or narrow gauge comes up in a new form in this company's case. The company having sued a number of subscribers to the stock to recover the amount of their subscriptions, answer is made that the subscriptions were made to build a railroad of standard gauge; the company has since resolved to make the road a narrow gauge, and the subscribers claim that they cannot be held, as the contract has been altered without their consent.

Kansas Pacific.

A Lawrence (Kan.) dispatch says that in the suits brought to recover damages for alleged false and fraudulent charges for Government transportation, the United States District Court has decided to sustain the demurrers filed by the company to the original petition.

New York Elevated.

In the suit brought to enjoin this company from completing its extension across the Battery in New York the Supreme Court has dismissed the complaint. The suit was brought by a property owner in the neighborhood who asked for the injunction on the ground that an old deed from the city contained a covenant that the Battery should always be preserved for public uses. The Court holds that the complainant's interest was not such as to give him a proper standing in the case, and that further the grant of right of way to the Elevated Railroad was for a public use and did not in any way interfere with the use of the Battery as a park or for other public purposes.

State Inspection of Railroads.

A bill has been introduced in the New York Assembly "to protect life and property on railroads." By its provisions, the State Engineer and Surveyor is required to examine all bridges, viaducts and other structures upon the railroads of the State, at least once in every four months. He is required to condemn any structure he may find unsafe, and to notify the company of that fact. The company is required to forthwith to condemn any structure he may find unsafe, and to notify the company of that fact. The company is required to forthwith to strengthen and repair such unsafe structure; and if they refuse to do so, a fine of \$100 a day shall be inflicted upon them for every day after the thirtieth day following the day on which notice was served upon the company by the State Engineer.

Illinois Central.

The Land Department reports for January sales of 592.02 acres for \$4,517.78. The cash collected on land contracts was \$14,233.87.

The Traffic Department reports the earnings of the Main Line in Illinois (707 miles) for 1877, \$374,837.76; 1876, \$426,162.68; decrease, \$51,324.92, or 12 per cent. The company's monthly circular says: "This company is in negotiation with the owners of the Iowa lines for a revision of the terms of lease. Meantime monthly statements of Iowa traffic will be omitted.

Chicago papers report the Iowa earnings as follows: 1877, \$91,661.23; 1876, \$127,411.25; decrease, \$35,750.02, or 28.1 per cent.

Alabama & Chattanooga.

The Legislature of Alabama offered last year to give certain lands in settlement with the holders of the \$2,000,000 direct 8 per cent. gold bonds of 1870. Most of the bondholders in London accepted the proposal and deposited their bonds with the appointed agents in that city, and now Messrs. Plock & Co., of No. 51 William street, New York, give notice that bondholders here should deposit with them, as the designated agents in this country, that the proposed settlement may be carried out.

The United States Circuit Court has confirmed the last sale of this road conditionally, ordering that the sale stand confirmed if the purchasers make the cash payment of \$80,000 required on or before Feb. 16. If they do not make the payment by that time the special master commissioners are required to sell the road again on Feb. 17, without further advertising, and are authorized to adjourn said sale from time to time, if necessary.

Colorado Pacific.

The trial of the suit brought by the United States to recover \$1,836,635, being 5 per cent. of the net earnings from July 16, 1869, to Oct. 31, 1874, began in the United States Circuit Court at San Francisco, Feb. 9. Both parties have agreed to admit all the essential facts, so that very little testimony will be taken and the case will turn entirely upon the legal points involved, which are the date of the completion of the road and how the net earnings are to be determined.

The Martinez (Cal.) *Gazette* says of the work on the loop line from Oakland to Banta: "The grading of the road-bed on the other side of San Pablo Creek was so far advanced several days since that a portion of the force was to be detached and set to work on the Point Couachal cut between San Pablo Valley and Pinole. This cut is the heaviest job on any part of the line, and will occupy as large a force as can work to advantage on it for several months; but as there are now about a thousand graders employed there will probably be some to spare for other portions of the line, even if there should be no increase of the force. The advanced corps of engineers engaged in resetting and correcting the line and grade stakes is now at work along the shore of the Strait, with its camp at the Chicken Ranch, about five miles below Martinez."

ANNUAL REPORTS.

Indianapolis, Bloomington & Western.

This property consists of the Main Line, from Indianapolis, Ind., to Pekin, Ill., 202.28 miles, which is extended to Peoria, 9.22 miles from Pekin, by the leased Peoria & Springfield road, making it 211.5 miles; and the Western Extension, which consists of a line from Champaign, Ill., to Havana, 100.63 miles, with a branch from White Heath to Decatur, 30.91 miles, being 131.54 miles. This property is in charge of Gen. George B. Wright as Receiver, pending suits for foreclosure of mortgage, and his latest report covers the year ending Nov. 30, 1876.

The equipment consists of 45 engines; 27 passenger, 3 baggage and smoking, 2 postal and 10 baggage, mail and express cars; 220 box, 117 stock, 171 coal, 104 flat and 26 caboose cars; 32 service cars. There are also on the road 500 new box cars which are being paid for by installments and 760 box cars rented from the Western Car Company. For a part of the year 19 engines were hired from the United States Rolling Stock Company.

The capital account is stated as follows:

Stock (\$22,797 per mile)	\$7,610,200.00
Funded debt (\$35,948 per mile)	13,000,000.00
Floating debt (\$10,776 per mile)	3,697,215.14

Total (\$69,521 per mile)

Of the funded debt \$5,500,000 is a first lien on the Western Extension. The capital account reported in the same as the Receiver reported last year, no account apparently being taken of the overdue coupons accrued since he took possession.

The work done was as follows for the whole line:

Passenger train mileage	567,445
Freight train mileage	931,195
Service and switching mileage	309,201

Total 1,807,841

Passenger carried	287,240
Passenger mileage	13,749,208
Tons freight carried	517,588
Tonnage mileage	66,065,767
Average passenger train load, number	24.25
Average freight train load, tons	70.95

The average receipt per ton per mile was 1.48 cents. The average cost of engine service was 17.9 cents per mile.

The earnings of the Main Line, 211.5 miles, were:

	1876-77.	1874-75.	Inc. or Dec.	P. c.
Freight	\$853,250.54	\$707,567.69	Inc. \$145,682.85	20.6
Passenger	380,501.38	359,594.39	Inc. 20,906.99	5.8
Mail and express	36,019.62	45,434.19	Dec. 9,414.57	20.7
Miscellaneous	102,249.00	60,856.68	Inc. 41,412.32	68.1
Total	\$1,372,020.54	\$1,173,432.95	Inc. \$198,587.59	16.9

Working expenses. 1,035,438.08 1,054,320.92 Dec. 18,882.84 1.8

Net earnings	\$336,582.46	\$119,112.03	Inc. \$217,470.43	122.6
Gross earn. per mile	6,487.09	5,548.15	Inc. 938.94	16.9
Per cent.	1,591.41	563.18	Inc. 1,028.23	182.6
Per cent. of expenses	75.47	89.85	Dec. 14.38	16.0

For the same period the operations of the Western Extension, 131.54 miles, were as follows:

	1876-77.	1874-75.	Inc. or Dec.	P. c.
Gross earnings	\$186,397.35	\$151,101.40	Inc. \$35,295.95	23.4
Expenses	192,743.51	151,063.25	Inc. 41,680.26	27.6
Deficit, or net	\$6,346.16	\$38.15
Gross earn. per mile	1,417.04	1,148.71		

mainly unsold at the close of the year. The sales for the year were 13,746 acres and 41 town lots. The receipts during the year from cash payments on sales, land-notes, rents and timber were \$29,435.10; expenses of Land Department, including taxes, \$15,971.11. There were \$22,064.85 land notes outstanding at the close of the year.

The work done was as follows:

Passenger train mileage.....	403,182
Freight " "	642,839
Service " "	204,468
Total.	1,250,489
Passengers carried.....	199,362
Passenger mileage (22.43 per train mile).....	9,044,895
Tons freight carried.....	223,106
Tonnage mileage (81.39 per train mile).....	52,310,056
Total expenses (91.39 per cent.)	1,810,960 75
Net earnings (\$322.74 per mile).....	\$170,608 58

The cotton carried was 205,871 bales, an increase of 48,748 bales, or 31 per cent. over the previous year. The cost of engine service per train mile was 28 cents. The receipts per train mile were: Passenger, \$0.88; freight, \$2.32; average, \$1.89; average expense, \$1.448; net, \$0.442.

The earnings for the year were as follows:

Freight.....	1,493,421 44
Passengers.....	356,496 63
Mail and express.....	102,734 11
Miscellaneous.....	28,916 72
Total (\$3,760.00 per mile)	\$1,981,669 33
Working expenses (74.36 per cent.)	\$1,473,521 81
Extraordinary expenses (17.03 per cent.)	337,438 94

Total expenses (91.39 per cent.).....

Net earnings (\$322.74 per mile).....

Working expenses (74.36 per cent.).....

Extraordinary expenses (17.03 per cent.).....

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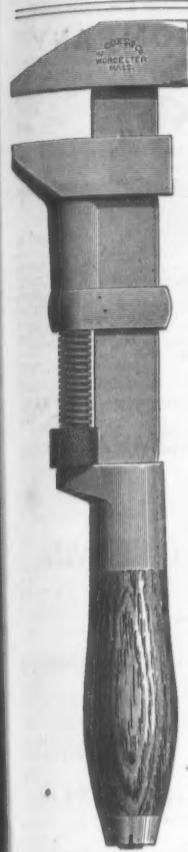
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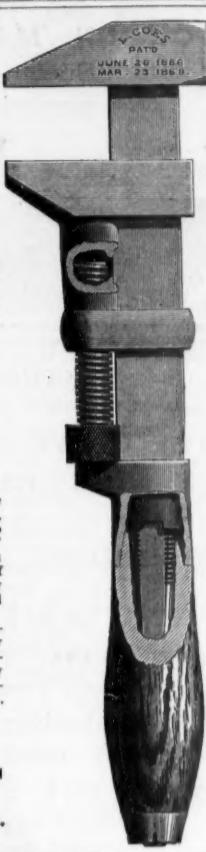
We invite the particular attention of the trade to our New Straight Bar Wrench, widened, full size of the larger part of the so called Lindsey's "REINFORCED OR JOG BAR." Also our enlarged jaw, made with ribs on the inside having a full bearing on front of bar (see sectional view), making the jaw fully equal to any strain the bar may be subjected to.

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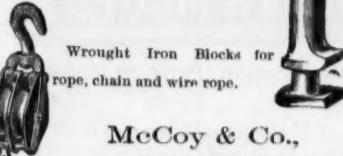
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Wrought Iron Blocks for
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Communications by letter will
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JACKS FOR PRESSING ON CAR-WHEELS OR CRANK PINS MADE TO ORDER.

CROCKER'S TICKET PUNCH.

Patented April 30,
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Suitable for any kind of
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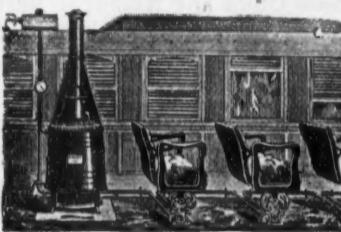
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No. 1330 Buttonwood st., Phila.



THE ASHTABULA BRIDGE DISASTER. OFFICIAL REPORT OF THE PROCEEDINGS OF THE CORONER'S JURY IN THE CASE.

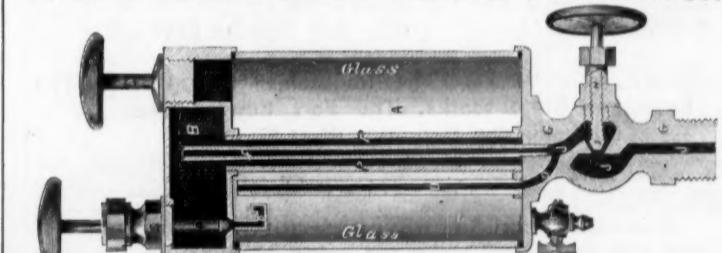
As soon as practicable after the closing of the official investigation of the Ashtabula Bridge accident, the Official Report of the Proceedings of the Coroner's Jury now sitting at Ashtabula, Ohio, will be published, edited by J. M. Goodwin, C. E., M. Am. Soc. C. E., who has acted as expert and associate counsel for the jury.

The Proceedings will be printed from certified transcripts from the notes of the stenographer to the long primer, leaded. It will have, probably, about 450 pp., and will contain Maps of the village of Ashtabula, and of the Station Grounds of the L. & M. S. Ry., at Ashtabula; view, from photograph, of the Bridge as it was before the disaster; the original design of the bridge; drawings, general and in detail, of the bridge as constructed; several strain-sheets prepared by engineers, witnesses before the jury; and a diagram showing the wreck of the bridge and train.

Several eminent bridge engineers have, after careful examination of the wreck of the bridge, testified before the jury and have submitted written statements which statements and the evidence in full will appear in the Proceedings. Mr. J. Tomlinson, C. E., of Ottawa, Canada, has also given testimony in the case, and Charles Hilton, C. E., of New York, will also appear as a witness.

The price of the book will be announced as soon as its cost can be determined. Orders may be sent to the Railroad Gazette, 73 Broadway, New York, or to J. M. GOODWIN, Room 12, Chamberlain Building, Cleveland, Ohio.

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These Lubricators are especially adapted to lubricating LOCOMOTIVES through the STEAM PIPES, and lubrication is directly under the control of the engineer. Lubrication always regular and constant. For particulars address

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&c., &c.

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OFFICE OF PURCHASING AGENT,
Lake Shore & Michigan Southern Ry.,
Cleveland, O., March 1, 1876.

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CAPITAL, \$3,000,000.



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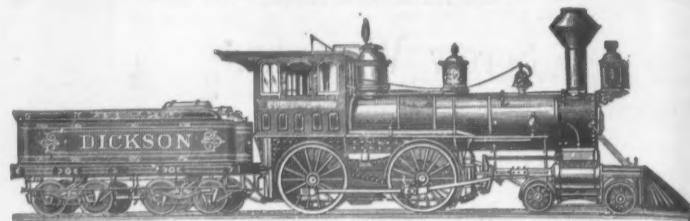
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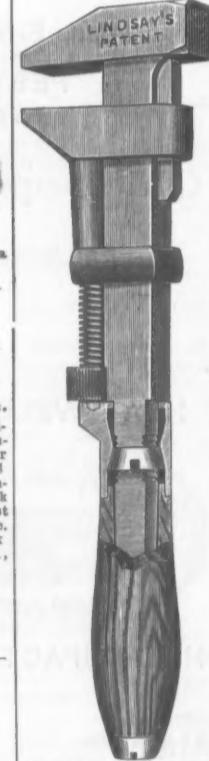


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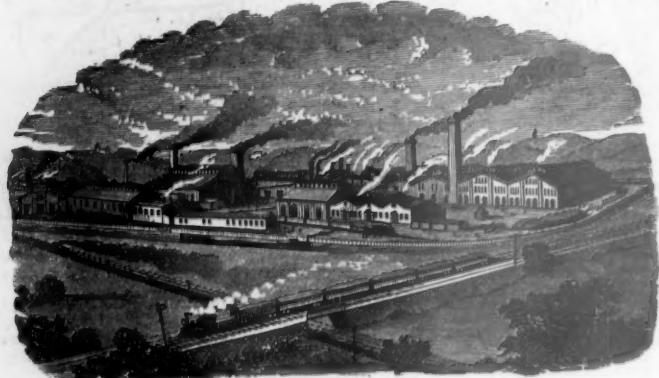
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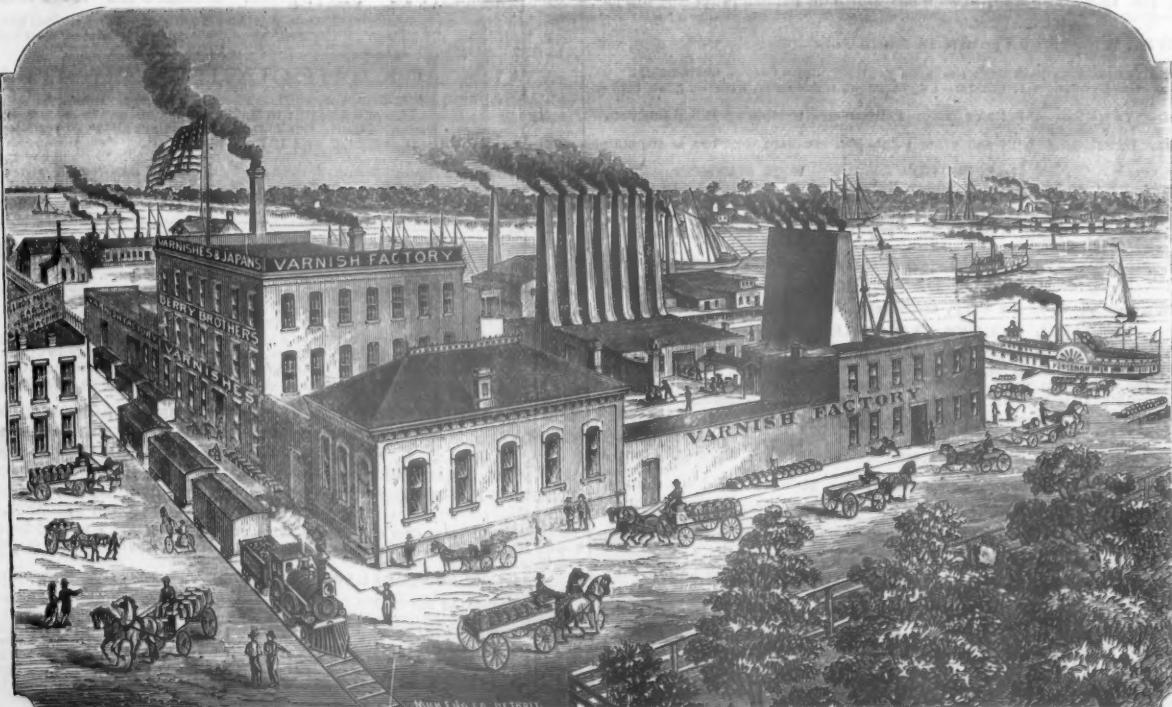
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